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16. ABSTRACT

A national emission standard for vinyl chloride emitted from ethylene dichloride-vinyl chloride and polyvinyl chloride plants is being promulgated under the authority of section 112 of the Clean Air Act. Vinyl chloride has been implicated as the causal agent of angiosarcoma and other serious disorders, both carcinogenic and noncarcinogenic, in people with occupational exposure and in animals with experimental exposure to vinyl chloride. Reasonable extrapolations from these findings cause concern that vinyl chloride may cause or contribute to the same or similar disorders at present ambient air levels. The purpose of the standard is to minimize vinyl chloride emissions from all known process and fugitive emission sources in ethylene dichloride-vinyl chloride and polyvinyl chloride plants to the level attainable with best available control technology. This would have the effect of furthering the protection of public health by minimizing the health risks to the people living in the vicinity of these plants and to any additional people who are exposed as a result of new construction. This is estimated to have the effect of reducing emissions from a typical ethylene dichloride-vinyl chloride plant by approximately 94 percent and from a typical polyvinyl chloride plant by approximately 95 percent. This document contains a summary of the public comments on the proposed standard and EPA's responses to the comments. It also contains updated information concerning the environmental and inflationary impacts of the standard.

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AND
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VOLUME 2: PROMULGATED EMISSION STANDARD FOR VINYL CHLORIDE

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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Emission Standards and Engineering Division

U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

September 1976

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Vinyl Chloride Emissions from Ethylene Dichloride-
Vinyl Chloride and Polyvinyl Chloride Plants
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on

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CHAPTER I. SUMMARY OF THE ENVIRONMENTAL IMPACT OF THE EMISSION STANDARD FOR VINYL CHLORIDE

Background: On December 24, 1975, the Environmental Protection Agency (EPA) proposed a national emission standard for vinyl chloride under the authority of section 112 of the Clean Air Act. At that time, EPA requested public comments on the proposal. Fifty comment letters were received from environmental groups, industry, State and local air pollution control agencies, and individual citizens. On February 3, 1976, EPA held a public hearing on the proposed standard in Washington, D. C. Both the written comments and the comments made at the public hearing as well as EPA's responses to these comments are summarized in this document. The summary of comments and responses serves as the basis for revisions which have been made to the standard between proposal and promulgation.

EPA decided to regulate vinyl chloride because it has been implicated as the causal agent of angiosarcoma and other serious disorders, both carcinogenic and noncarcinogenic, in people with occupational exposure and in animals with experimental exposure to vinyl chloride. Reasonable extrapolations from these findings cause concern that vinyl chloride may cause or contribute to the same or similar disorders at present ambient air levels. The purpose of the standard is to minimize vinyl chloride emissions from all known process and fugitive emission sources in ethylene dichloride-vinyl chloride and polyvinyl chloride plants to the level attainable with best available control technology. This will have the effect of furthering the protection of public health by minimizing the health risks to the people living in the vicinity of these plants and to any additional people who are exposed as a result of new construction.

Alternatives to the Proposed Action: The alternatives to the proposed action are discussed in detail in Chapter 5 of Volume I of the Standard Support and Environmental Impact Statement (SSEIS, Vol. I.). These alternatives concern the quantity of energy required to incinerate the emissions from the oxychlorination process in ethylene dichloride-vinyl chloride plants and the degree to which EPA should require developing technology for controlling emissions from the processing of dispersion resins in polyvinyl chloride plants. These alternatives remain unchanged since the standard was proposed.

Environmental Impact of the Standard: Changes in the standard since proposal do not affect the level of control required. Therefore, the environmental impacts for the promulgated standard and alternative control levels are essentially the same as described for the proposed standard in Chapters 1 and 6 of the SSEIS, Vol. I. There is one exception. Based on data submitted by the Society of Plastics Industry, Inc. (SPI), the impact on water consumption (SSEIS, Vol. 1) was overstated. In estimating the impact on water consumption, EPA based its estimates on worst case conditions. That is, EPA assumed that those control systems with the greatest water usage would be employed and that there would be no recycling of water. There is no regulation which would require water recycling. According to SPI, the control system utilizing the most water will not be used generally by the industry and economics will cause plants to recycle much of the water. Therefore, the impact of the standard on water consumption will be negligible. A more detailed discussion of the water consumption impact can be found in the first comment in Section 2.8 of Chapter 2 of this document.

A summary of the environmental impact of the promulgated standard is as follows:

The primary environmental impacts of the standard are beneficial and will consist of reductions in vinyl chloride emissions from ethylene dichloride-vinyl chloride and polyvinyl chloride plants, and consequently, corresponding reductions in ambient air concentrations of vinyl chloride and risks to health in the vicinity of these sources. Although the standard will not eliminate all vinyl chloride emissions, it will further the protection of public health by minimizing emissions. For a typical average-sized ethylene dichloride-vinyl chloride plant, the standard will reduce hourly vinyl chloride emissions from 176 kg to 10 kg. This is approximately a 94 percent reduction. For a typical average-sized polyvinyl chloride plant, the hourly vinyl chloride emissions will be reduced from 330 kg to 16 kg, or by approximately 95 percent. Percentage numbers for both source categories are based on an estimated 90 percent reduction in fugitive emissions and 1974 emission levels.

There are several potential secondary environmental impacts of the standard. These include increased atmospheric emissions of hydrogen chloride, lowered pH of inprocess wastewater due to hydrogen chloride, small increases in the quantity of vinyl chloride released into inprocess wastewater, increased solid waste disposal due to carbon used for adsorption, and increased energy consumption. The types and degree of the secondary impacts resulting from the standard will vary from plant to plant depending on the type of control selected to meet the standard.

The potential secondary environmental impacts of the standard are either insignificant or will be minimized without additional action, except for one adverse impact. Hydrogen chloride is already emitted by process equipment at ethylene dichloride-vinyl chloride plants and by other petrochemical plants in the complexes where ethylene dichloride-vinyl chloride plants are typically located. An incinerator used to attain the standard at an ethylene dichloride-vinyl chloride plant could increase hydrogen chloride emissions by several fold. Typically, however, due to the corrosion problems which would otherwise occur both on plant property and in the community, plants use scrubbers to control already existing hydrogen chloride emissions. Hydrogen chloride emissions resulting from control of vinyl chloride emissions are expected to also be controlled for the same reason. If even a moderately efficient scrubber (98 percent control) were used to control the hydrogen chloride emissions resulting from incineration of vinyl chloride emissions, the increase in hydrogen chloride emissions from a typical ethylene dichloride-vinyl chloride plant due to the standard would be reduced to 35 percent. However, EPA plans to further evaluate the need to control hydrogen chloride emissions, since diffusion model results indicate that under "worst-case" meteorological conditions, the hydrogen chloride emissions from the process equipment and the incinerator combined would cause maximum ambient concentrations of hydrogen chloride in the vicinity of ethylene dichloride-vinyl chloride plants to be in the same range or somewhat higher than existing foreign standards and National Academy of Sciences (NAS) guidelines for public exposure.

Economic Impact of the Standard: In accordance with Executive Order 11821 and OMB Circular A-107, EPA carefully evaluated the economic and inflationary impact of the proposed standard and alternative control levels. The economic analysis is contained in Chapter 7 of the SSEIS, Vol. I. Since changes in the standard since proposal do not affect the level of control required, the economic impacts of the promulgated standard and alternative control levels are essentially the same as described for the proposed standard. There is one exception. EPA estimated that there would be four plant closures as a result of the promulgated standard. Of the four plants identified as possible closure candidates, one (Occidental Petroleum Corporation's polyvinyl chloride plant in Hicksville, N. Y.) has given notice that it no longer produces polyvinyl chloride, and the other three (Jennat Corporation's plants in Somerset, N. J., Torrence, Calif., and Tucker, Ga.) have indicated that they do not intend to close as a result of the standard.

A summary of the economic impact of the promulgated standard is as follows:

The total capital cost for existing plants to meet the standard is estimated to be $198 million, of which $15 million is for ethylene dichloride-vinyl chloride plants and $183 million is for polyvinyl chloride plants. EPA estimates that these plants will have to spend $70 million per year to maintain the required emission levels. In addition, total capital cost for existing plants to meet the EPA's 1983 water effluent guideline limitations is $83 million and the total annualized operating cost is $17 million. The costs to the industry of meeting the OSHA standard cannot be quantified at this time, but they are expected to overlap to some degree with the costs to meet EPA's fugitive emission regulations. The costs of meeting the fugitive emission regulations are included in the total costs cited above for meeting the promulgated regulation. Broken out separately, the capital cost of meeting the fugitive emission regulations is $37 million and the annualized cost is $25 million.

The promulgated standard is not expected to deter construction of new ethylene dichloride-vinyl chloride plants or most types of new polyvinyl chloride plants. For one type of polyvinyl chloride plant (dispersion process) that represents 13 percent of the industry production, the standard would significantly deter the construction of smaller plants.

It is estimated that the price of polyvinyl chloride resins would rise by approximately 7.3 percent in order to maintain precontrol profitability and also to recover the total annualized control costs necessitated by the standard at ethylene dichloride-vinyl chloride plants and polyvinyl chloride plants. This increase is estimated to translate into a maximum consumer price increase in goods fabricated from polyvinyl chloride resins of approximately 3.5 percent. Recovery of effluent annualized costs plus maintenance of precontrol profitability is estimated to add approximately 2 percent to polyvinyl chloride resin prices and result in an additional maximum consumer price increase of 1 percent.

Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enforcement of Long-Term Production: By taking steps now to establish standards based on best available control technology to minimize vinyl chloride emissions, EPA will be able to minimize exposure and prevent severe illnesses and deaths which may have occurred in future years as a result of prolonged community exposure to vinyl chloride. Therefore, the standard may curtail industrial expansion on a short-term basis, as a result of funds being diverted from support of industrial expansion to support of installation of process changes and control systems to attain the standard; but it will enhance the long-term productivity of man and his environment.

Irreversible and Irretrievable Commitments of Resources: Irreversible and irretrievable resources which would be committed to reduce ambient concentrations of vinyl chloride include energy and the materials to construct incinerators, boilers, monitoring equipment, carbon adsorption units, etc. If incineration were used to meet the standard, additional energy and materials would be needed for operation of an absorption unit to abate hydrogen chloride emissions.

CHAPTER 2
SUMMARY OF PUBLIC HEARING AND COMMENTS

2.1 List of Commentators

Comment No.	Commentators
VC-1	Robert A. Fine Hooker Chemical Corporation
VC-2	Constance Panchuk PARKLABREA
VC-3	Mr. and Mrs. F. B. Minnock (U. S. Resident)
VC-4	Marilyn E. Sadowski (U. S. Resident)
VC-5	Dr. Martin Wersba (U. S. Resident)
VC-6	Dr. John F. Finklea National Institute for Occupational Safety and Health
VC-7	Susan Howard (U. S. Resident)
VC-8	Gayle and Herb Weaver (U. S. Resident)
VC-9	Dr. Peter F. Infante National Institute for Occupational Safety and Health
VC-10	June Armstrong (U. S. Resident)
VC-11	Robert H. Collom, Jr. Department of Natural Resources (Georgia)
VC-12	Harry H. Hovey, Jr. N. Y. State Department of Environmental Conservation
VC-13	R. W. Laundrie The General Tire and Rubber Co.
VC-14	R. E. Widing PPG Industries, Inc.

Comment No.	Commentators
VC-15	Allan J. Topol Covington & Burling (for Tenneco Chem.)
VC-16	Ed Light West Virginia - Citizen Action Group
VC-17	F. V. Prus The Goodyear Tire and Rubber Co.
VC-18	David A. Kuhn Continental Oil Co.
VC-19	Flynt Kennedy Continental Oil Co.
VC-20	Lee E. Jager Department of Natural Resources (Michigan)
VC-21	W. W. Madden Firestone Plastics Co.
VC-22	W. C. Holbrook B. F. Goodrich Chemical Co.
VC-23	Barry I. Castleman Environmental Defense Fund
VC-24	Harvey A. Rosenzweig Borden, Inc.
VC-25	R. N. Wheeler, Jr. Union Carbide Corporation
VC-26	J. M. DeVoe Allied Chemical
VC-27	R. E. Van Ingen Shell Chemical Co.
VC-28	Gary L. Ford Stauffer Chemical Co.
VC-29	Ralph L. Harding, Jr. The Society of the Plastics Industry, Inc.
VC-30	Earl R. Smith Dow Chemical U.S.A.

Comment No.	Commentator
VC-31	Robert W. Hill Diamond Shamrock Corporation
VC-32	Richard Fleming Air Products and Chemicals, Inc.
VC-33	R. A. Abramowitz R. A. Fine Hooker Chemical Corporation
VC-34	Mitchell R. Zavon, M.D. Ethyl Corporation
VC-35	John C. White EPA - Region VI
VC-36	Jack Jaglom The Pantasote Company of New York, Inc.
VC-37	Professor Benjamin Linsky West Virginia University
VC-38	Sidney M. Wolfe, M.D. Health Research Group
VC-39	Kip Howlett Georgia-Pacific Corporation
VC-40	Keysor-Century Corporation
VC-41	John M. Daniel, Jr. State Air Pollution Control Board (Virginia)
VC-42	Charles R. Barden, P.E. Texas Air Control Board
VC-43	Dr. Thomas A. Robinson Vulcan Materials Co.
VC-23a	Barry I. Castleman Environmental Defense Fund
VC-44	George P. Ferreri Bureau of Air Quality and Noise Control (Maryland)

Comment No.	Commentator
VC-45	James F. Coerver Louisiana Air Control Commission
VC-46	Sidney R. Galler U.S. Department of Commerce
VC-47	James C. Miller, III Council on Wage and Price Stability
VC-48	Stephen C. Urman Occupational Safety and Health Administration
VC-49	Stanley D. Doremus U.S. Department of the Interior
VC-50	Edward F. Ferrand Environmental Protection Administration (N.Y.)

Chapter 2 contains a summary of the public comments on the proposed standard and EPA's responses to them. The comments are divided into sections. The first section discusses the rationale for regulating vinyl chloride under the authority of section 112 of the Clean Air Act; i.e. EPA's decision to list vinyl chloride as a hazardous air pollutant and the approach used for regulating vinyl chloride under section 112. The next three sections discuss the selection of source categories, the emission limits, and testing, reporting, and recordkeeping requirements. The comments in these three sections are organized to correspond with the different section numbers in the proposed standard. The remaining sections include comments on the test methods, economic and environmental impacts, process and control technology, and the Quantitative Risk Assessment for Community Exposure to Vinyl Chloride. Comments on the Scientific and Technical Assessment Report for Vinyl Chloride and Polyvinyl Chloride are included in section 2.2.1 on EPA's decision to list vinyl chloride as a hazardous air pollutant.

2.2 Rationale for Regulating Vinyl Chloride Under the Authority of Section 112 of the Clean Air Act.

2.2.1. Decision to List Vinyl Chloride as a Hazardous Air Pollutant.

(Except for commentators VC-32, VC-23, and VC-46, the comments contained in this section generally did not contest EPA's decision to list vinyl chloride as a hazardous air pollutant. However, they did argue that EPA has placed great and sometimes unwarranted emphasis on factors suggesting the possibility of a health risk while "playing down" or not even mentioning factors which suggest that there may be no significant risk at all. Examples cited by the commentators are listed below).

1. VC-22, VC-27, VC-29, VC-32

Comment: The U. S. worker EPA discussed as having been exposed to vinyl chloride levels lower than those usually encountered in polyvinyl chloride production has been dropped from the National Institute of Occupational Safety and Health's listing of workers with angiosarcoma.

Response: Table 6.18, page 73, of the Scientific and Technical Assessment Report (STAR) includes the data which were available at the time of publication, documented by the Center for Disease Control. Dr. John T. Herbert, Center for Disease Control, was contacted by telephone on March 29, 1976. Dr. Herbert, on that date, stated that the information in Table 6.18, including the footnotes was still correct. He also stated that four additional cases from Canada had been added to the list. There are questions concerning the level of exposure of those cases not involved directly in polyvinyl chloride and vinyl chloride production, and in some cases the pathology. These uncertainties are stated in the appropriate footnotes to table 6.18. However, in spite of these uncertainties, in view of the possible exposure patterns, these cases cannot be ignored in the evaluation of the potential public health problems.

2. VC-22, VC-29, VC-27, VC-32, VC-46

Comment: EPA has not summarized the results from the more extensive ambient monitoring program but stated that the results from the more extensive ambient monitoring program are generally in the same range as found in previous studies except for peak concentrations. The more recent data actually show significantly lower ambient concentrations of vinyl chloride than previously measured.

Response: A report entitled "EPA Programs of Monitoring Vinyl Chloride in Ambient Air" summarizing the data from the more extensive monitoring program was made available by EPA. A detailed analysis comparing the results from the two monitoring programs has not been performed by EPA. The sampling procedures, placement of samplers, extent of sampling, and quality of analysis were not the same in the two programs. Only one of the plants monitored in the second program was also monitored in the first program.

3. VC-22, VC-29

Comment: EPA has stated that "Occupational exposure studies have strongly implicated vinyl chloride as a human chemical carcinogen ...". It should be noted that these studies were conducted at relatively high levels compared to ambient concentrations now being detected.

Response: It is still true, however, that occupational exposure studies do indeed implicate vinyl chloride as a human carcinogen which manifests itself in liver angiosarcoma, and suggest that it may also manifest itself in multiple tumor sites. Because of the rarity of angiosarcoma, the cause-effect relationship has been clearly demonstrated. Vinyl chloride is one of the few industrial carcinogens for which confirmatory animal studies have been positive.

4. VC-22, VC-27, VC-29, VC-32, VC-36

Comment: The preamble and Volume I of the Standard Support and Environmental Impact Statement (SSEIS, Vol. I) refers to "some occasional peak concentrations as high as 33 ppm." The STAR document correctly states that there was one instantaneous value of 33 ppm which was observed at a distance of 0.5 km from the center of the plant and 4 mean values exceeded 1 ppm. The data from the 24-hour integrated samples indicated the highest value to be 0.55 ppm for the November 1974 study."

Response: There was only one peak value of 33 ppm and it occurred in a grab sample.

5. VC-22

Comment: EPA states that approximately 4.6 million people live within a 5-mile radius of ethylene dichloride/vinyl chloride and polyvinyl chloride manufacturing facilities. The implication that these people are being exposed to vinyl chloride is questionable. The basis for using a 5-mile radius is questionable since EPA has done no sampling beyond a 3-mile radius. According to the "Quantitative Risk Assessment for Community Exposure to Vinyl Chloride," approximately 1.7 million people live within a 3-mile radius of such plants.

Response: Dispersion model calculations indicate that vinyl chloride concentrations of greater than 1 part per billion (ppb) can be found beyond the 5-mile radius. The five miles was chosen as a practical matter since population estimates were available for that distance. The average concentration calculated depends only slightly on radius.

6. VC-22, VC-32, VC-46

Comment: In the preamble to the proposed standard and in Chapters 1 and 2 of the SSEIS, Vol. I, it is stated that "reasonable extrapolations from these findings cause concern that vinyl chloride may cause, or may contribute to, the same or similar disorders ...". There is no reference given to support or explain what such reasonable extrapolations were, nor is specific data presented to substantiate such concern.

Response: Section 112 of the Clean Air Act defines the term "hazardous air pollutant" as "an air pollutant to which no ambient air quality standard is applicable and which in the judgment of the Administrator may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness." The sentence in question refers to the factors the Administrator considered in his judgment that vinyl chloride should be listed as a hazardous air pollutant. These factors include:

(1) Data from occupational exposure studies indicate that vinyl chloride is a carcinogen, and possibly a mutagen and teratogen.

(2) Data from animal exposure studies demonstrate that vinyl chloride is a carcinogen and a teratogen.

(3) Data from microbial systems indicate that vinyl chloride is a mutagen.

(4) Vinyl chloride has been measured in communities surrounding ethylene dichloride-vinyl chloride and polyvinyl chloride plants.

(5) The threshold for effects has not been demonstrated. In absence of proof to the contrary, EPA believes that it is prudent to assume that there is no no-effect level.

(6) There is an expected latency period of 20 years or more from the time of community exposure to vinyl chloride and the appearance of effects.

7. VC-17, VC-22, VC-27, VC-29, VC-32, VC-46. Public Hearing Record--Presentation of P. J. Gehring of Dow Chemical, p. 87.

Comment: EPA has implied that vinyl chloride is "an apparent non-threshold pollutant." Laboratory data on metabolism has been developed under Manufacturing Chemists Association administered research study. The data indicate that there are at least two different metabolic routes for destroying vinyl chloride, and therefore, raise questions as to the validity of the EPA stated assumption.

Response: The results of the recent studies by Dr. P. J. Gehring are indeed significant; however, they are not sufficient to resolve the issue of a biological threshold, or to establish such a value. Dr. Gehring's studies reflect a short-term response to relatively high levels of exposure (one hour of 50-1,000 ppm). Studies by Dr. Selikoff on industrial workers exposed to vinyl chloride for more than five years reveal that the substance bioaccumulates, and is not excreted or otherwise metabolized after five weeks of non-exposure. Thus, one short-term response to high-level exposure is irrelevant in terms of long-range responses to chronic low-level exposure.

[illegible]

Comment: Human cases of cancer alleged to be associated with vinyl chloride monomer in the United States are limited to only four plants. Among more than 50 other plants no other cases have been validated, despite the long history of exposure to substantial concentrations.

Response: These four plants are among the oldest plants in operation. The range in the age of the plants is from 29 to 41 years. There is another plant that has been in operation for 29 years and one that has been in operation for 28 years. All others have been in operation less time. Thus, the four plants referred to have been in operation long enough for the latent period to become manifested.

9. VC-22, VC-27, VC-29

Comment: The STAR report devoted 12 paragraphs to describing Dr. Infante's work and only one sentence to the professional in depth study by the Center for Disease Control (CDC). CDC studied one of the four cities studied by Infante and concluded that "although the followup study reported here confirmed a moderate increase in central nervous system (CNS) malformation in Painesville, Ohio, it could not establish any association between cases and vinyl chloride exposure."

Response: During the initial preparation period of the STAR document, the Infante study contained the only available information regarding congenital malformations in communities with possible exposure to vinyl chloride. Just prior to publication, preliminary information regarding the CDC study became available and was included in the STAR document. The space devoted to the studies should not be interpreted as indicative of their relative significance. The limitations of the Infante study were discussed in the STAR document. The questions of mutagenic and teratogenic effects resulting from exposure to vinyl chloride still have not been resolved. Nonetheless, the suggestive evidence available cannot be ignored.

10. VC-22, VC-27, VC-29, VC-32

Comment: The STAR document states that "limited measurements around vinyl chloride and polyvinyl chloride production facilities indicate that contiguous populations are being exposed to levels of vinyl chloride of potential public health concern." EPA states that part of the basis for this statement is two community cases of angiosarcoma, which are of questionable relationship to vinyl chloride. The commentator agrees that the two community cases are questionable. Neither has been confirmed as being caused by exposure to vinyl chloride. On the other hand a more recent document published by EPA, the Quantitative Risk Assessment for Community Exposure to Vinyl Chloride, states that there is "no evidence that living around vinyl chloride plants is a factor in the occurrence of liver angiosarcoma."

Response: The statement from the Quantitative Risk Assessment for Community Exposure to Vinyl Chloride is taken out of context. The following is an extract from the subject document:

"This survey has produced no evidence that living around vinyl chloride plants is a factor in the occurrence of liver angiosarcoma. This conclusion is far different than saying that living around plants is not a risk factor for several reasons: (1) This type of survey of a disease with a latent time from first exposure to diagnosis of 17 years reflects exposures that started at some time before 1957, when the quantities of vinyl chloride produced were much smaller than the current production levels. (2) This survey did not include the place of occupation of the currently suspected collection of liver angiosarcoma cases. Therefore, it underestimates the risk of being near a vinyl chloride plant. (3) This survey might not have detected all existing liver angiosarcoma cases, although the number we have is consistent with the national statistics. The circumstantial evidence for this is that there was not substantial overlay between the three sources of case information. If the data sources had been complete, the information collected by CDC from the National Center for Health Statistics would contain all the cases reported by both the Armed Forces Institute of Pathology and the state health department. (4) In over 90 percent of the cases traced in this survey, the only information available was the residence at the time of death and in some cases, the residence of the spouse or parent only. This information is only a crude indication of where the individuals spent most of their lives. (5) In contrast with our expectation when the survey was started, there is a significant rate of changes in diagnosis after the slides are confirmed by the National Cancer Institute. The 286 cases currently on file cannot be regarded as definitely established liver angiosarcoma.

11. VC-22, VC-32

Comment: Chapter 6 of the STAR document includes an extensive bibliography on vinyl chloride monomer toxicology and epidemiology. There are at least three additional scientific documents which have become available that are pertinent and should be made a part of the EPA hearings docket.

(a) "Report on Mortality Data Collected by Organization Resources Councilors, Inc., Concerning the Effects of Vinyl Chloride Exposure in PVC Fabrication." (Available from ONC, 1625 I Street, N. W., Washington, D. C. 20006).

(b) "Metabolic Studies in Vinyl Chloride as a Function of Concentration" by Dow Chemical Company under Manufacturing Chemists Association administered research study. (Available from MCA, 1835 Connecticut Avenue, N. W., Washington, D. C. 20009).

(3) "Inhalation Toxicity of Vinyl Chloride" by Industrial Bio-Test Laboratories, Inc., under Manufacturing Chemists Association administered research study. (Available from MCA, 1825 Connecticut Avenue, N. W., Washington, D. C. 20009).

Response: It is stated in the Preface of the STAR document that information available through June 1, 1975, was generally considered, and further that references cited did not constitute a complete bibliography. The more recent references cited by the commentator are pertinent, and are incorporated into the bibliography by referencing them in this document.

12. VC-46

Comment: There are speculative statements made by EPA which should be qualified as such. EPA stated that the "latency period can possibly be longer for lower levels of exposure." Also that "EPA will be able to reduce substantially the risks that severe illnesses and deaths will occur in the future as a result of the present and prolonged community exposure to vinyl chloride."

Response: In the first sentence, the words "can possibly" qualify the sentence so that a reader would not think that there is proof that the latency period would be longer for lower levels of exposure. The second sentence states that the EPA regulation would decrease risk of severe illness and not necessarily the severe illness.

13. VC-46

Comment: The terms "non-threshold pollutant" and "apparent non-threshold pollutant" are not proper and are inappropriately applied to vinyl chloride.

Response: The paragraph referred to explains that data are available which make it clear that vinyl chloride is hazardous within the definition of section 112 at higher levels of exposure. However, since there are no dose-response data on health effects of vinyl chloride at lower levels of exposure (below 50 ppm), a threshold level of effects cannot be defined for exposure levels of vinyl chloride found in the ambient air. There is no conclusive evidence that there is a threshold concentration of vinyl chloride below which cancer does not occur. Therefore as a matter of prudence, EPA assumes that some risk exists for any level of vinyl chloride exposure, and proposes to reduce this risk with the current regulation.

14. VC-21, VC-26, VC-27, VC-29, VC-32, VC-34

Comment: EPA has not taken sufficient cognizance of either the cost of, or the improvements from, efforts made to comply with the Occupational Safety and Health (OSHA) standard. A principle reason these effects are "uncertain" is that the Agency has made no effort to measure them. Some of the efforts are complimentary, others are totally separate, and the costs are not altogether overlapping. Ventilation contributes only an insignificant reduction in the vinyl chloride levels in the work place and, therefore, any concern that the emissions found in 1974 would continue are completely unfounded. Any justification as to the need for an emission reduction should be based on those emissions found after completion of all projects designed to comply with the OSHA regulation.

Response: EPA stated in the preamble to the proposed standard that the OSHA standard is expected to indirectly reduce atmospheric emissions to some degree, but that the degree is unknown. In the SSEIS, Vol. I, the reason that the degree is unknown is explained. The OSHA standard requires that employee exposure be reduced to 1 ppm. It does not prescribe the means for doing this. It does require that employers institute feasible controls to the fullest extent possible and to continue to improve and apply engineering controls until full compliance is achieved. Some of the engineering controls used to meet the OSHA standard can also be used to meet EPA's standard. Since a plant owner knows both what OSHA and EPA expect he can plan so that he can use some of the same controls to meet both standards. OSHA did not prescribe any deadlines for compliance through engineering controls. The plants are expected to use some combination of respiratory protection, ventilation techniques, and emission reduction. The plants are not expected to be uniform in what they use. OSHA does not require submittal of a formal plan describing what the plants plan to use. Therefore, in order to find out how much emission reduction the OSHA standard is achieving, EPA would have to send to each plant a request for information on the controls they are using, the controls they plan to use, and how much these controls will reduce emissions. This does not seem to be necessary, since it is not likely to change EPA's standard. If the plants are using engineering controls rather than ventilation and respiratory protection to meet the OSHA standard, this is achieving both OSHA and EPA goals. On plant visits EPA has observed that engineering controls have been employed to a large extent, but that ventilation practices are still employed to some extent. An example would be open-sided buildings.

With regard to cost, EPA has always been interested in obtaining figures on the cost of the OSHA standard. During the February 3, 1976, public hearing Susan Wyatt of EPA asked Ralph Harding of the Society of Plastics Industry (SPI) how much of the cost to meet EPA's standard can also be attributed to meeting the OSHA standard. (Public Hearing Transcript, p.69). Mr Harding replied that he did not know and that it is a premature number at this time. He continued by saying that he thought they were interrelated, but that he didn't think the industry was ready to ascribe "which costs to which standard." In order to get information on the costs of the OSHA standard, EPA would have to request each plant to submit cost figures for both present and future controls. The benefits from this exercise are not apparent.

15. VC-21, VC-32, VC-34

Comment: Ventilation used to meet the OSHA standard dilutes emissions and decreases ambient concentrations.

Response: Ventilation can reduce ambient concentrations, although not necessarily. An example would be an open-sided building. EPA considers technology for reducing emissions as a more reliable method for reducing ambient concentrations.

16. VC-27, VC-29, VC-32, VC-34

The emission levels reported in the supporting documents are overstated. Fugitive emissions in particular are overstated because they are based on a materials balance and because polyvinyl chloride solids were incorrectly included in the fugitive vinyl chloride losses. The fugitive emissions reported for 1974 have been substantially reduced since that time because of the OSHA standard. Stack emissions have also been reduced since 1974. These overstated emission levels were used in diffusion calculations, and so the maximum ambient concentrations reported by the diffusion model are also overstated.

Furthermore, the maximum ambient concentrations do not present a realistic picture of what is occurring around the plants. Worst conditions are assumed in the modeling. The maxima occur within 80 to 220 meters of the model plants which is still well within the plant limits for all but the smallest plants.

Response: All emission levels reported in the preamble and supporting documents are based on 1974 data. This qualification is stated in all places where emission data are presented. EPA recognizes that emissions have been reduced since that time, and has so stated in the preamble to the proposed standard. EPA has decided not to gather more recent data on emission levels, because these emission levels are expected to continue to change, and gathering the data would take considerable time both on the part of EPA and on the part of industry. Since the purpose of the standard is to minimize emissions, these more current data would not affect the standard itself. In other words, EPA's purpose is to apply best control technology, not to reduce fugitive emissions by 90 percent. More current data on emission levels would reduce the relative impact of the standard on the ambient air concentrations which are presented in the chapter on environmental impacts. All diffusion modeling data contained in the environmental impact chapter are qualified by stating that they are based on 1974 data.

EPA did include polyvinyl chloride solid losses in the fugitive emission estimates. This was based on a discussion with plant engineers from one company who described unaccounted for polyvinyl chloride losses as "very, very small." The fugitive emission estimates include only unaccounted for polyvinyl chloride losses. In EPA's judgment polyvinyl chloride solid losses are more easily accounted for than vinyl chloride gaseous losses. Polyvinyl chloride collected in baghouses or cyclones can be weighed. The efficiencies of these collection devices are known, so the loss from them can be calculated. Polyvinyl chloride discharged into wastewater settles out and can be weighed. This is not true for vinyl chloride gas. If it were assumed that 50 percent of the emissions were solid as was suggested by the commentator, a typical 68 million kilogram per year plant would lose nearly 2000 kg of polyvinyl chloride per day. Because polyvinyl chloride losses are more easily accounted for, they are considered to be lower than this. Thus, EPA assumed that all unaccounted for losses were vinyl chloride monomer.

With regard to diffusion modeling, it seems reasonable to estimate the worst atmospheric concentrations that are to be expected. It should be emphasized that these estimates were based on worst, but realistic conditions. Eighty to 220 meters from the center of the plant would in many cases be on plant property. At one plant that was monitored, a sampler was located across the street from a plant and was about 200 meters from the primary emission point. In EPA's modeling, all emissions were assumed to occur from the center of the plant property. In fact, emission sources, particularly at polyvinyl chloride plants are located more diffusely on the plant property. Fugitive emission sources, in particular, are likely to be located closer to plant property lines than assumed. For this reason they may have a larger impact outside of the property lines than indicated by the diffusion modeling.

Although the estimated maximum concentrations of vinyl chloride were given in the SSEIS, Vol. I, EPA also states in the Quantitative Risk Assessment Document that an average exposure of 17 ppb was estimated to exist within a 5-mile radius of an average plant. This figure was also based on 1974 emission levels.

17. VC-32, VC-34, VC-46

Comment: Available health data are not sufficient to justify regulating vinyl chloride under section 112. Section 112 of the Clean Air Act allows the Administrator to regulate those substances which may cause or contribute to an increase in mortality, or an increase in serious irreversible or incapacitating reversible illnesses. In the case of vinyl chloride, none of these requirements had been reported outside of the plant which can be traced directly to any plant or to any manufacturing use of vinyl chloride or the formation of polyvinyl chloride products.

Response: As implied by the commentator, no community cases of angiosarcoma have been verified as being caused by ambient exposure to vinyl chloride. Thus, there is no proof that vinyl chloride ambient concentrations cause cancer, teratogenesis, and mutagenesis. The data base showing that vinyl chloride causes these effects as a result of occupational exposure is a very strong one. The latency period for developing cancer due to vinyl chloride exposure is indicated to be at least 20 years. Section 112 defines a hazardous pollutant as one which "may cause or contribute to ..." (emphasis added) rather than one which has been proven to cause or contribute to certain effects. As stated in the preamble to the proposed standard, EPA has concluded that it should take action now to reduce exposure levels to vinyl chloride before retrospective evidence of risk is allowed to show itself.

18. VC-32

Comment: Standards for vinyl chloride should be set under the authority of section 109 or 111 of the Clean Air Act. Although the preamble to the proposed standard asserts that section 109 treatment of vinyl chloride would be inappropriate "because vinyl chloride is a localized problem and section 109 is usually more appropriate for regulating pollutants whose presence in the ambient air is ubiquitous," the absence of clustering of incidences of liver angiosarcoma demonstrates that the problem is not localized. Moreover, the recent joint publication of the American Health Foundation and the National Cancer Institute suggests that vinyl chloride may well be ubiquitous in the ambient air because of the combustion of vegetation.

EPA has implicitly accepted that an ambient concentration not exceeding 1 ppb vinyl chloride is sufficient to provide an ample margin of safety to the public health. An ambient air standard under section 109 to this effect would properly protect the public. We also support an appropriate new source standard for vinyl chloride under section 111.

Response: The reason for not using section 109 is not related to whether there is a clustering of angiosarcoma cases. Section 109 is usually not used for pollutants which are emitted from a relatively small number of source types of which there are a relatively few plants. EPA has stated that it does not know what the threshold level of effects for vinyl chloride is, and thus does not know what level would provide an ample margin of safety.

EPA has left open the option of setting standards in the future for new sources under section 111. Such standards could require increased control of the oxychlorination process or more stringent stripping limitations. As an alternative to section 112, however, EPA concluded that section 111 is not the best mechanism for controlling vinyl chloride. Specifically, the length of time required under section 111(d) from State to State, State-granted variances that may be based only on cost considerations, and standard development as a State rather than a Federal process are all features that make section 111 unacceptable for a substance which fits the definition of a "hazardous air pollutant."

19. VC-6

Comment: "This letter is in regard to the most recent assessment of health problems which may follow exposures to vinyl chloride. It is our hope that this assessment may be of some assistance to your Agency in discussion of standards to limit vinyl chloride emissions into the ambient air. Two studies that are conducted by NIOSH and CDC personnel which directly bare on this issue of community effects are those which Dr. Infante of NIOSH performed while he was at the Ohio Health Department and subsequent investigations by the Division of Cancer and Birth Defects of the Bureau of Epidemiology in Atlanta. Enclosed are copies of these two studies.

"Our scientists may differ in their interpretation of particular studies in relation to vinyl chloride exposure and teratogenesis. They are, however, in complete agreement that while the issue is not yet resolved, the potential public health ramifications remain a cause for concern. Please note that we are speaking only of vinyl chloride monomer-VCM, and not of polyvinyl chloride plastic.

"The points raised in conversations with your office dealt specifically with the issue of teratogenicity of VCM among humans. Neither the Infante nor the CDC study resolve the matter. Dr. Infante's study used available birth and fetal death record information and identified three areas with increased rates of central nervous system malformations. The CDC investigation followed up cases in one city and found no parental association between VCM exposure and plant employment. There also appeared to be no differences between cases and controls with respect to location of residence relative to the plant in Painesville. In this circumstance no association could be established with VCM. However, the authors stated, "This study clearly does not rule out the possibility that vinyl chloride may be teratogenic." Because of the small numbers of cases involved, there still might be an effect that was not detectable in Painesville.

"It is important to remember that the possible effects of VCM exposure also include mutagenicity. Mutagenesis and carcinogenesis are sufficiently correlated that demonstration of one is cause for concern about the other. The carcinogenicity of VCM in humans is well demonstrated via the NIOSH cohort mortality study and by various animal studies. There are also data to demonstrate VCM-induced transplacental carcinogenesis in rats. In the past year, several reports have indicated that VCM is mutagenic via the microbial test system, and that VCM metabolities have induced mutations in the mammalian cells. Likewise, four independent reports from four different countries have shown an excess of chromosomal aberrations in lymphocytes of workers exposed to VCM as compared to controls. I should also note that NIOSH is participating in a collaborative study with a university and representatives from labor and management of workers exposed to vinyl chloride in Pottstown, Pennsylvania which should provide additional information on the mutagenic potential of vinyl chloride. We anticipate that a preliminary report of this study will be available in the near future, and we will transmit a copy of this report to you hopefully before completion of your public hearings and comment period. Thus, while no conclusive data are available concerning mutagenesis in the human setting, such animal and laboratory findings suggest a need for caution with respect to human exposures."

Response: EPA appreciates the information submitted by the commentator.

20. VC-9

Comment: The commentator submitted the following five papers dealing with vinyl chloride.

1. Waxweiler, Richard J., et al., "Neoplastic Risk Among Workers Exposed to Vinyl Chloride," Annals New York Academy of Sciences.

2. Infante, Peter F., et al., "Genetic Risks of Vinyl Chloride," NIOSH, Post Office Building, Room 515, Cincinnati, Ohio 45202, January 28, 1976. (Prepublication Copy)

3. Infante, Peter F., "Oncogenic and Mutagenic Risks in Communities with Polyvinyl Chloride Production Facilities."

4. Waxweiler, Richard J., "Vinyl Chloride: More Than An 'Occupational' Hazard?", APHA, November 1975.

5. Edmonds, Larry D., et al., "Congenital Malformations and Vinyl Chloride," The Lancet, November 29, 1975, p. 1098.

2.2.2. Approach for Regulating Vinyl Chloride Under Section 112.

1. Proceedings of the Public Hearing, Presentation by Barry Castleman of the Environmental Defense Fund, p.9; VC-23, VC-10, VC-2, VC-7, VC-16.

Comment: The standard should be based on a cost/risk analysis rather than best available control technology. In other words, a socially acceptable risk should be determined. The socially acceptable risk should be justified by the social importance, that is, the benefits to society of the article, whose production entails the risk. EPA did not seriously evaluate the desirability of continuing all existing uses of vinyl chloride. The Environmental Defense Fund (EDF) pointed out several uses of vinyl chloride for which EPA named no substitutes if polyvinyl chloride were banned. One of these was credit cards. Credit cards are also one of the fastest growing uses of polyvinyl chloride.

A 95 percent reduction of vinyl chloride emissions should reduce risk of adverse health effects, but will not necessarily minimize health risks. Section 112 requires more protection of public health than the proposed standard will provide, especially in view of the evidence that polyvinyl chloride products also cause adverse health effects. An example is hydrogen chloride fumes from burning polyvinyl chloride products.

A zero emission limit should be established for vinyl chloride. Vinyl chloride should be phased out. Vinyl chloride usage should be banned now for products for which substitutes are available. Substitutes should be developed for the remaining uses of vinyl chloride, and all vinyl chloride usage should be banned eventually.

Response: In the preamble to the proposed standard EPA named its reasons for not setting a zero emission limit for vinyl chloride, as follows: (1) There are beneficial uses of vinyl chloride products for which desirable substitutes are not readily available, (2) there are potentially adverse health and environmental impacts from substitutes which have not been thoroughly studied, (3) there are a number of employees, particularly in the fabrication industries, who would become at least temporarily unemployed, and (4) control technology is available which is capable of substantially reducing emissions of vinyl chloride into the atmosphere.

EPA agrees that substitutes do exist or could be manufactured for most vinyl chloride or polyvinyl chloride uses. However, in general, these substitutes do not have some of the more desirable characteristics of polyvinyl chloride, such as nonflammibility. If vinyl chloride and polyvinyl chloride were banned, other substitutes with these more desirable characteristics would likely be developed.

EPA presently has no direct control over which substitutes are developed or used. There is a risk that these substitutes would also have adverse health or environmental effects. Since control measures are available which can reduce emissions by 90 percent or more, it does not seem prudent to reduce emissions by the remaining 10 percent and take the risk of introducing new untested chemicals into the environment.

2. VC-3, VC-4, VC-5, VC-8, VC-41

Comments: These commentators favor the approach and standard adopted for vinyl chloride.

Response: No response is required.

3. VC-17

Comment: There are no readily available substitutes for polyvinyl chloride products. Any imposed substitution of other materials for polyvinyl chloride products without consideration of the possible adverse consequences that may result, may have a dramatic impact on our way of life, including the curtailment of new developments in such areas as medicine, communication, automotive manufacturing, aircraft and building industries and fire retardation and safety equipment. The substitution for polyvinyl chloride products may have a greater adverse and detrimental effect on both the environment and the general public's health than the present polyvinyl chloride products.

Response: This appears to be a response to the comments made by the Environmental Defense Fund at the public hearing. No response is required by EPA.

4. VC-46

Comment: Reference is made that the immediate original impact of a ban would be felt primarily in areas of Southwest Texas and Southern Louisiana where fourteen of the seventeen plants are located. Commentator VC-46 believes this statement should be qualified since it is entirely possible that communities within these areas could conceivably be in the total state of unemployment if such a ban were to be enforced.

Response: The fourteen of seventeen plants referred to are ethylene dichloride-vinyl chloride plants, and these plants are located mainly in Southwest Texas and Southern Louisiana. These plants are typically located in large petrochemical complexes.

It is very doubtful that a ban on vinyl chloride would cause the cities of New Orleans, La.; Houston, Tx.; Baton Rouge, La.; and Long Beach, Calif. to be in a total state of unemployment. Polyvinyl chloride and fabrication plants are more widely dispersed throughout the country.

5. VC-16

Comment: The vinyl chloride standard is not stringent enough. More stringent restrictions could include (1) no variances on time schedules to install the best available controls, (2) zero emission limits for substitutable uses of polyvinyl chloride plastics after one year, and (3) zero emissions for all sources of vinyl chloride after three years.

Responses: A response to suggestions 2 and 3 can be found under comment #1 in section 2.2.2. In regard to the first suggestion, the Clean Air Act allows for a waiver period of up to two years after the standard is promulgated to comply with the standard, provided that EPA "finds that such period is necessary for the installation of controls ...". Variances will not be granted unnecessarily. In many cases it takes much longer to install control equipment than the 90 days that the Clean Air Act allows for compliance. Waivers will be granted only for the time that is necessary to install controls. The standard requires control of several emission points. It is probable that control equipment can be installed on some points sooner than others. Compliance for each different point will be required as expeditiously as practicable.

6. VC-29, VC-31, VC-32,

Comment: Industry suggests that EPA expend more effort on the fine tuning of the cost/benefit ratio. There are several requirements in the proposed standard which offer little benefit in terms of emission reduction for the costs required. They are: requiring replacement of single seals on rotating equipment with double seals; installation of car unloading purge units at plants where monomer delivery by rail car is infrequent; the requirement for stripping all dispersion resins to 2000 ppm; excessive recordkeeping, and a gasholder.

The risk of vinyl chloride exposure appears to be entirely limited to workers in polyvinyl chloride plants. There is no basis for the prohibition of vinyl chloride and polyvinyl chloride, as some demand, or for a standard which requires expenditures bearing no reasonable relationship to the benefits obtained.

Response: Section 111 of the Clean Air Act provides for the development of standards based on best control technology (considering costs). Even under section 111, however, standards are not based on a fine balancing of costs versus benefits. Instead, costs are determined in terms of the affordability of the control technology required to achieve a given emission level and the economic impact of possible standards on the industry in question. Unlike section 111, section 112 does not explicitly provide for consideration of costs, so it would clearly be inappropriate to consider costs to a greater extent under section 112 than would be done under section 111. As discussed in the preamble to the proposed standard for vinyl chloride, EPA believes costs may be considered under section 112, but only to a very limited extent; i.e., to assure that the costs of control technology are not grossly disproportionate to the amount of control achieved. Requiring a large energy expenditure to control relatively small emissions from the oxychlorination vent appeared to be a cost which would be grossly disproportionate. The items mentioned by the commentators do not fit in the same category with the oxychlorination process. Responses on the technical issues raised about these items are contained in other areas of this report.

7. VC-34

Comment: EPA's assumption of exposures being directly related to mass emissions is incorrect. The effectiveness should be related to risk reduction and not to mass emissions reduction. Dryers in a typical suspension plant contribute 16 percent of mass emissions and only 2 percent to the maximum exposures. Reduction in these emissions would be less effective in reducing risk than reduction in fugitive emissions.

Response: The relative effect of stack emissions and fugitive emissions on ambient air quality depends on the meteorological conditions and the distance from the source. In general the fugitive emissions seem to have a greater impact as the distance from the source decreases. The plume from stack emissions may come down to ground level at a greater distance from the source. The maxima in Chapter 6 of the SSEIS, Vol. I were relatively close to the plant and thus the fugitive emissions tended to be the major contributor to the maxima. If concentrations had been cited for greater distances from the plant, the stack emissions may have been the primary contributor. Thus, reduction in dryer emissions is not necessarily less effective in reducing risk than reduction in fugitive emissions.

8. VC-17

Comment: The capital and operating expenditures required to install control technology are non-productive. EPA should consider this in its determination of whether controls are needed, particularly in the absence of any conclusive medical evidence that vinyl chloride emissions have a detrimental effect on the general public living in the neighborhood of such plants.

Response: EPA realizes that the costs to install and operate control systems are generally nonproductive. This is the reason EPA does an economic impact study. Installation of controls does have some positive impact on costs to the plant in that more vinyl chloride is recovered. This is also considered in EPA's economic study.

9. VC-46

Comment: Three alternatives are proposed in the report. One alternative would accomplish a 90 percent emission reduction in the entire plant; another 94 percent; and another 97 percent. The reason for selecting the 94 percent emission level is unclear, and this selection should be carefully and thoroughly explained since the reduction difference between the three options is only 7 percent and the difference between the lower and middle option is only 4 percent.

Response: It is assumed that the commentator is discussing the alternatives for the oxychlorination process in ethylene dichloride-vinyl chloride plants. The reasons for the selection of these three alternatives is explained thoroughly in Chapter 5 of the SSEIS, Vol. I. The reason that the relative degree of difference between the reduction levels for the three alternatives is relatively small is that the oxychlorination process is only one of several emission points in an ethylene dichloride-vinyl chloride plant and on the average it represents only 10 percent of the emissions from the plant. The alternatives actually represent a range in emission reduction for the oxychlorination process from 0 to 99 percent.

The reason that the 94 percent level was selected is explained in detail in section 8.2.1 of Chapter 8 of the SSEIS, Vol. I. In summary, the 97 percent reduction level was not selected because of the large energy expenditure required. The 94 percent reduction level would achieve some degree of emission reduction without incurring the large energy expenditure.

10. VC-26

Comment: IF OSHA allows 1 ppm (8-hour average) as safe to the health of workers then likewise an ambient air concentration should be considered rather than an emission standard.

Response: The level of the OSHA standard is not derived from a health data base. Response to comment VC-32 (page 16) states why EPA did not choose the ambient standard approach.

11. VC-18

Comment: A standard for ambient concentrations of vinyl chloride can be based on OSHA's standard. The OSHA action level is 0.5 ppm for 8 hours a day, 5 days a week exposure. An equivalent safe maximum 24-hour environmental exposure would be 119 ppb (8 hr ÷ 24 hr x 5 days ÷ 7 days X 500 ppb).

Response. Same as for 10.

12. VC-46

Comment: The statement is made that "Congress never discussed the particular problems associated with apparent non-threshold pollutants." If Congress did not discuss these problems, it is difficult to justify EPA's attempt to regulate substances which they consider non-threshold pollutants without more justification than is presented in this section.

Response: Congress clearly intended for EPA to regulate substances which "in the judgment of the Administrator may cause, or contribute to an increase in serious irreversible, or incapacitating reversible, illness." EPA has determined that vinyl chloride is such a substance for the reasons stated in response to comment #6 in section 2.2.1. The fact that sufficient data are not available to delineate a threshold level of effects for vinyl chloride does not mean that it should not be regulated.

13. VC-46

Comment: EPA should clarify whether worst case effects were assumed in establishing the proposed standard.

Response: The proposed standard is based on best available control technology and is intended to minimize emissions and risk. The meaning of the comment is not clear. Worst case effects has no apparent relationship to the basis of the standard.

14. VC-46

Comment: In the preamble to the proposed standard and on pages 8-38 and 8-39 of the SSEIS, Vol. I,there is discussion about the reasons for stating the emission levels for sources following the stripper in two different ways. This discussion seems to infer that the regulation is proposed for the sake of regulation and enforcement rather than for accomplishing safety in the surrounding communities.

Response: The goal of the standard which is, as suggested, "the safety in the surrounding communities" is achieved through the amount of emission reduction required. Both ways in which the standard for sources following the stripper is written achieve essentially the same degree of emission reduction.

15. VC-32

Comment: The proposed standard is unnecessary to provide an ample margin of safety to protect the public health because the margin of safety which EPA has implicitly accepted as ample has already been achieved by industry as a result of the OSHA standard for vinyl chloride and industry's increasing awareness and understanding of the health hazard of high level exposure to vinyl chloride.

Response: EPA is aware that emissions have been reduced as a result of the OSHA standard and industry's awareness of the vinyl chloride problem. EPA's standard will further reduce emissions. Since the threshold level of effects for vinyl chloride is unknown, EPA has determined that it is prudent to minimize emissions by requiring this additional control.

16. Proceedings of Public Hearing, Presentation at the Public Hearing by Barry Castleman, p.16.

Comment: EPA should have declared vinyl chloride as a hazardous air pollutant in June 1974. That way the final standards would have been due by June 1975. The public would have been spared an additional year of unregulated emissions. EPA compiled a best available technology standard after observing the industry through 1974. Through almost all of 1975, the standard was reviewed by industry, the public and other government agencies. It is important to try to put regulations out and shorten this review process.

Response: EPA also favors expeditious rulemaking. However, for the vinyl chloride standard there were many technical details and issues that needed to be resolved before the standard could be proposed. Preparation of environmental and economic impact statements for the standard is time-consuming but has beneficial effects in decision-making and in understanding the impact a standard will have. EPA's policy of having a recommended standard reviewed by other groups within EPA, other federal agencies, interested parties, and public advisory committees before it is proposed or promulgated is also beneficial to the quality of the standard.

17. VC-42

Comment: EPA should provide for a continuous ambient monitoring program for vinyl chloride in those cases where densely populated areas are located within five miles from affected plants. Although ambient standards for vinyl chloride have not been set, historical ambient data for this air contaminant should be collected because of strong implications that it is a human chemical carcinogen. Without ambient monitoring the efficacy of emission controls will not be known if and when carcinogenicity is confirmed at low ambient levels.

Responses: Ambient monitoring after the standard goes into effect would be useful for the reasons suggested by the commentator. EPA may establish such an ambient monitoring program as resources and other priorities permit.

18. VC-24

Comment: The following section should be added to the standard:

"The Administrator may waive application of the foregoing regulations (Sections 61.62 -61.65, Sections 61.67 - 61.70) when the owner or operator of a vinyl chloride plant or polyvinyl chloride plant demonstrates to the Administrator that emissions of vinyl chloride from the plant undergo dispersion sufficient to provide adequate dilution of the concentration of vinyl chloride insuring an ample margin of safety. In making this determination the Administrator may consider:

(1) ambient monitoring data
(2) the location of persons living around the plant site
(3) other relevant information"

Response: EPA has stated that sufficient data is not available to establish a threshold level of effects for vinyl chloride. For this reason, EPA has not been able to identify a numerical ambient concentration which would provide an ample margin of safety. Furthermore, Section 112 provides for the establishment of emission standards. It does not provide for establishment of an ambient air quality standard which can be met by dilution.

19. VC-22

Comment: In the second paragraph of page 1-6, it is noted that the standard would be applicable to an existing process, as well as "any other process developed in the future." This statement is far-reaching and conjectural. It is not clear how EPA could realistically regulate specific emission limitations on a future process yet even to be developed, particularly when the basis for the current limitations stems from the application of the best available control technology currently existing.

Response: The statement on page 1-6 refers to the fact that EPA does not want to limit the standard to existing polymerization processes by name, because a new variation on the polymerization process could be developed and not be covered by the standard only because it was not specifically named. The control technology required for the existing polymerization process is essentially the same and is likely to apply to new types of polymerization. Existing processes vary depending on whether water is used, how much detergent is used, etc. The equipment used in the various processes is similar.

20. VC-23

Comment: EPA should make a formal commitment to conduct a complete review of the standard one year after promulgation. EPA should keep pushing for improved technology to reach the ultimate goal of zero emissions. EPA should review all new construction to see that best control technology available at the time is installed.

Response: It is EPA's policy to review the need to change standards as new technology is developed. Priorities would determine when a standard is revised. Priorities are determined by the amount of impact a new standard or revised standard for a particular pollutant would have in comparison to setting or revising standards for another pollutant.

21. VC-42

Comment: EPA should push the development of improved stripping technology by setting a two-phase standard. The first phase would require stripping to 400 ppm as proposed. The second phase would have a plant-wide fixed-point emission standard of 100 kg vinyl chloride per million kg of polyvinyl chloride in any product, averaged over any calendar day. The second phase standard could be achieved in 5 years.

Response: EPA also favors development of improved stripping technology. Section 112 of the Clean Air Act doesn't directly provide for a two-phase standard. It states that a plant must meet a standard within 90 days of promulgation, unless a waiver of compliance is obtained. If a waiver is obtained, the plant must meet the standard within two years of promulgation. EPA can revise the standard at a later date.

EPA's requirement for stripping to 400 ppm does not preclude the States from setting more stringent standards. Technology is being developed which can reduce the stripping levels below 400 ppm for many resins. States may decide to require plants, particularly new plants, to adopt this new technology and reduce emissions even more. The 400 ppm limit should not be considered an end-point in the development of improved stripping technology.

The basis of the 100 kg vinyl chloride per million kg product is unclear. The controls which would be used to attain this level were not described in the comment.

22. VC-24

Comment: The technology necessary to achieve compliance with the proposed regulation is untried. There are some indications that compliance with the regulations may create other equally troublesome problems. As an example, recovered vinyl chloride monomer has been found to contain certain polyperoxides which are percussion sensitive thereby creating an explosion hazard. If these by-products of emission control create significant health hazards, the regulations should provide a mechanism whereby the Administrator can modify the regulations on an emergency basis.

Response: All the technology required by the standard has been used. The industry has been recovering vinyl chloride in the past for economic reasons and that a problem with polyperoxides exists has not been mentioned previously.

23. VC-44

Comment: The standard should include a specification for plume dispersion hardware to preclude the possibility that the dryer stream may be discharged at near ground level. The concentration of vinyl chloride in the dryer exhaust may well exceed 10 ppm and be carried at this level for some distance if no stack is used. In fact, air flow calculations for a polyvinyl chloride dispersion plant in Maryland indicate that there would be a possible maximum ambient concentration in excess of 1.0 ppm across the property line after the plant has met the provisions of the proposed regulations.

Response: In order to require plume dispersion hardware, since a number of plants would be involved, EPA would have to specify an ambient air quality goal for vinyl chloride. EPA has not done this because there is not sufficient data on health effects to establish a numerical threshold of effects for vinyl chloride.

In visiting polyvinyl chloride plants, EPA has observed that dryer stacks are generally 15 meters high and discharge horizontally. Concentration levels of 1 ppm are of concern. States may find that they want to require dispersion hardware to further reduce ambient concentrations. The fact that EPA has not required dispersion hardware does not preclude States from doing so, nor should it discourage them from doing so.

24. VC-42

Comment: The standard should include a limit on the mass emissions allowed per unit time. Otherwise, the total emissions will simply grow as plant size increases.

Response: There are advantages to a mass per unit time standard. It could be used to limit growth as suggested. It would also clearly preclude dilution as a means of attaining the standard.

EPA, however, did not propose a mass emission limit for two reasons:

(1) The standard is based on best available control technology rather than an ambient air quality goal. If the ambient air quality goal approach had been used, EPA would have calculated an emission rate for the entire plant which would allow the plant to meet the ambient air quality goal under worst case conditions. The emission rate in kg/hr would have been adopted as the standard.

(2) The air volumes and mass emissions from specific emission points, particularly at polyvinyl chloride plants, fluctuate. There are a number of pieces of equipment at each plant. The configuration for ducting the emissions from the different pieces of equipment varies from plant to plant. Reactors and strippers at most plants are batch processes. Capture and ducting of fugitive emissions to a control device is intermittent. Sufficient information is not available for developing a mass emission standard which could be applied to all plants.

2.3. Selection of Source Categories

2.3.1 §61.60

1. VC-13, VC-17, VC-19, VC-20, VC-21, VC-22, VC-25, VC-26, VC-28, VC-29, VC-40

Comment: Research and development facilities should be exempted from regulation. Research, testing, and pilot plants are important tools in developing new products, improving productivity, devising new procedures to achieve lower emissions, and enhancing safety. Such work involves reactions of vinyl chloride in small glass vessels, miniature reactors set up on a laboratory bench and/or small reactors. These facilities are operated on a "need to investigate" basis and therefore operate intermittently. To require that each reaction or other experiment be fully equipped with the various required control devices to meet a 10 ppm maximum concentration would be extremely burdensome as well as delay needed work to advance emission and safety control technology.

Many experimental equipment set-ups are not permanent installations. In fact, a particular set-up may involve only one experiment. To comply with the proposed standard, the operator would have to conduct emission tests, prepare an initial operating report and a semi-annual report, and maintain records of emissions for two years.

In addition to testing and reporting, the requirements in the section on fugitive emissions become quite cumbersome in pilot operations. The sample flask system on a small reactor becomes almost as large as the reactor itself. Pilot size pumps are simply not available with double mechanical seals. Finally, a formal leak detection and elimination procedure would be burdensome, and stripping of waste water to 10 ppm vinyl chloride concentration seems excessive in this case.

The current data in Table I, collected from 14 members of SPI representing 75 percent of the nameplate polyvinyl chloride capacity in the United States illustrates that estimated emissions from 113 test sources account for less than 0.06 percent of the total monomer emissions from all sources before control and 1.0 percent after all model plant controls are in use.

The vessels used for these experiments range from under 3.78 l (1 gal) to 4158 l (1100 gal). The ninety vessels of 189 l (50 gal) and below represent more than 50 percent of these emission sources. Commentator VC-29 recommends that vessels 1890 l (500 gal) and under be exempt from all emission standards because of the aforementioned data and because OSHA guidelines adequately protect the workers. Vessels over 1890 l (500 gal) should be required to limit emissions to 5 kg (5 lb) vinyl chloride monomer per 100 kg (100 lb) of polyvinyl chloride produced.

Table I. EMISSION DATA ON LABORATORY AND PILOT FACILITIES USING VINYL CHLORIDE

Company Code	Reactor Size (gal.)	Number of Units	Produced Rate (lb/yr)	Estimated Total Emissions per Year (lb)	Resin Use
A	50	2	30,000	400	Testing and scrap
B	0.4	6	1,084	89	Experimental
	3.25	1	987	100	Experimental
	300	1	36,450	5,000	Tests, trials in lab and to customers
C	50	1	17,000	2,800	Sold as off grade
D	0.5	1	192	48	Scrap
	0.8	4	2,112	697	Scrap
	0.8	2	600	878	Scrap
	15	6	23,100	240	Scrap
	30	1	960	240	Scrap
	30	2	28,800	266	Scrap
	1100	2	666,000	10,656	Scrap
E					Divided between:
	300	2	113,812	10,000	1. Experimental evaluation & tests
	5	3	400	6,075	2. Customer samples
	10	1	100	3,038	3. Remainder is placed in landfill (about 80%)
F	.5	1	380	25	Experimental
	10	2	27,338	1,600	Experimental
	50	2	136,687	10,800	Experimental
G	.5 to 2	11	16,000	225	Scrap
	50 to 100	5	10,000	500	Scrap
	750	2	50,000	2,000	Customer Sampling and scrap
H					
	200	1	72,900	17,045	Testing
	15	1	5,468	928	Testing
	10	1	608	100	Testing
	50	7	75,634	4,870	Testing
	200	1	2,430	192	Testing
	220	1	12,029	3,110	Testing
	500	2	7,594	60	Testing & sampling
	1,000	1	33,413	460	Testing & sampling
J	5	4	76	8	Testing & scrap
	30	1	5,285	321	Testing & scrap
	300	1	31,894	2,582	Testing & scrap
K	2.5	1	1,823	100	
	10	1	606	30	
L	12.5	4	15,480	1,548	
	200	1	24,000	2,400	
M	30	2	34,172	375	Product research
N	10	2	66,582	21,920	Blending and/or scrap
	30	1	24,698	2,740	Blending and/or scrap
O	0.5	1	1,200	1,700	Testing
	1	7	1,063	350	Testing
	10	2	304	50	Testing
	100	1	6,075	1,000	Testing
	500	1	1,519	100	Testing
	600	1	364,500	4,000	Testing & blending into normal production

Other cut-off points were suggested by other commentators. VC-13 wants to exempt all research and pilot plant facilities. VC-40 wants to exempt reactors with a capacity of 7560 l (2000 gal) or less. This would also essentially exempt all research and development facilities. Commentator VC-27, the operator of an ethylene dichloride-vinyl chloride plant, requested that quality control facilities be exempted from the standard.

Response: As stated in the preamble to the proposed standard, EPA recognizes that some small research and development facilities may exist where the emissions of vinyl chloride are insignificant and covering these facilities under the standard would be unnecessary and inappropriate; however, EPA did not have sufficient information available to clearly define which facilities should be excluded from the standard. The standard has been revised so that it exempts polyvinyl chloride reactors and associated process equipment from applicability of the standard if the reactors are used for research and development and have a capacity of no more than 0.19 m^3 (50 gal). The figure 0.19^3 (50 gal) was selected because it distinguishes between research and development equipment that is generally found in the laboratory and that which is found in pilot scale facilities. The emissions from the laboratory scale facilities are relatively small and application of the controls required by the standard would be impractical and expensive. Reactors greater than 0.19 m^3 (50 gal) in size but no more than 4.07 m^3 (1100 gal) are required to meet the 10 ppm emission limits for reactors, strippers, monomer recovery systems, and mixing, weighing, and holding containers. Research and development equipment in this size range would encounter technical problems in meeting other parts of the standard. For most resins meeting the reactor opening emission limit involves reducing the number of reactor openings. In research and development the reactors have to be opened after every batch for thorough cleaning. With regard to the stripping requirements, one of the purposes of research and development is to gain an understanding of the conditions which need to be carried out during the stripping operation for a particular resin to meet the standard. The first part of the research involves development of a marketable product. A later phase involves development of the stripping conditions for the resin. Each batch in a research and development reactor could not be expected to meet the stripping limitations. Averaging would not help because typically only one or two batches are made daily.

The figure 4.07 m^3 (1100 gal) was selected as an upper cut-off limit because there are no commercial reactors below this size.

An exemption for research and development equipment in ethylene dichloride-vinyl chloride plants is not needed. Most research at these plants involves the oxychlorination process. Requiring pilot scale oxychlorination processes to meet the stack standard is consistent with requiring research and development equipment in polyvinyl chloride plants to meet the 10 ppm limits. The fugitive emission limits apply only to equipment "in vinyl chloride service."

Since the equipment in the oxychlorination process is not "in vinyl chloride service," the fugitive emission requirements would not apply to the research and development equipment.

Quality control facilities do not need to be exempted, because they are not covered by the standard. Equipment which is not specifically named by the standard (e.g., reactors, strippers, oxychlorination process, etc.) would not have to be controlled.

2. VC-25

Comment: Copolymer resin plants manufacturing resins with less than a 50 percent vinyl chloride content should be regulated as any other polyvinyl chloride resin plant is regulated. EPA should, however, clarify the application of the proposed standard to operations involving vinyl chloride use on an intermittent basis. On any given day, our plant may manufacture copolymers containing vinyl chloride or it may be manufacturing an unrelated material. Vinyl chloride monomer will be stored on the premises permanently though use is intermittent. EPA should not require records, tests, and reports for the whole operation of the plant, except when vinyl chloride is being used. Each production run of a latex containing vinyl chloride should not be counted as a new source and a reactor line should not have to be requalified via emission tests and an initial report each time a production run is made.

Response: On days when vinyl chloride is being stored and not used, the only part of the regulation which would appear to apply would be the requirement for detection and elimination of leaks from the storage equipment. Any reports and records would simply indicate which days vinyl chloride was or was not being used. The plant would not be considered a new source each time it started producing a vinyl chloride-containing product.

3. VC-25

Comment: Solution resins should be exempted from the standard, because emissions from manufacturing solution resins compose only 0.028 percent of the total, EPA doesn't understand the solution process, and the proposed standard does not adequately consider solution polymerization technology.

Response: There is only one plant making solution resins. This explains, at least in part, why the emissions are relatively low and why EPA did not concentrate more time on this process. The fact that only one plant makes solution resins is not a reason for exempting the plant from regulation. The number of plants in other parts of the country is irrelevant to the effects of the solution resin plant in the community surrounding it. The information presented in the comment letter indicated that this plant is capable of meeting the standard.

2.4 Emission Limits

2.4.1 §61.62(a), 61.63(a), and 61.64(a)(1),(b),(c), and (d).

1. VC-14, VC-18, VC-21, VC-22, VC-29

Comment: It has not been demonstrated that incineration, carbon adsorption, and solvent absorption can achieve the proposed emission limit of 10 ppm under different production conditions at all sources. It is arbitrary for EPA to base a standard on the operation of experimental or infrequently used control devices required by the standard to operate at their best efficiency 100 percent of the time. Some thought should be given to alternate actions in case these devices prove unworkable.

Commentator VC-18 also stated that carbon adsorption is not attractive for vinyl chloride plants because impurities in the recovered vinyl chloride prevent putting it back into the production line. Commentator VC-18 also pointed out that the results from the test EPA conducted on an incinerator showed higher emissions from the HCl scrubber following the incinerator than from the incinerator itself. He recommended changing the standard to 50 ppm now and revising it later to reflect best available control technology as it is verified and demonstrated.

Response: EPA has acknowledged that relatively little data exists on the emission levels achievable for carbon adsorption, solvent absorption, and incineration at ethylene dichloride-vinyl chloride and polyvinyl chloride plants. During the development of the proposed standard, these control techniques were being used by only a few plants, so little testing was done. EPA did test one incinerator. The outlet concentration averaged over six runs was 4 ppm. Thus, the proposed standard is set higher than the average measured concentration to allow for a variation in conditions among plants. Furthermore, EPA feels that the 10 ppm limit has been demonstrated from incinerators on similar streams to those in ethylene dichloride-vinyl chloride and polyvinyl chloride plants.

Furthermore, conditions of the stream that is to be treated at a particular plant are taken into account in designing a control device to meet the standard. The standard accounts for normal fluctuations in emissions by permitting averaging of emissions. Compliance with the 10 ppm limit is to be determined by averaging together the results of these runs. Each run consists of sampling for a minimum of an hour.

If carbon adsorption is not a feasible control technique for a vinyl chloride plant, incineration is a viable option. There is no apparent reason to increase the 10 ppm limit to 50 ppm based on the data that are available.

EPA does not know why the vinyl chloride concentration from the HCL scrubber outlet was higher than the concentration going into the scrubber. The water used in the scrubber was from a wastewater sump, so there is a possibility that it did contain vinyl chloride. Water samples were taken from the scrubber and were reported to contain no vinyl chloride. However, the water samples may have been taken improperly. At the time of this test, EPA had not specified a method for measuring vinyl chloride in water. If the container used to obtain the sample was not completely filled with water, then vinyl chloride in the water could have escaped into the air space in the container above the water so that it was not measured. The test discrepancy does not detract from the figure of less than 10 ppm for the exit stream from the incinerator.

2. VC-14

Comment: Sections 61.62(a) and 61.63(a) prohibit the discharge of exhaust gases which contain 10 ppm vinyl chloride or greater from "any equipment." As worded, these sections apply to fugitive emission sources as well as stack emissions. These sections should be amended to limit their applicability to stacks and vents used specifically for purposes of discharging vinyl chloride-containing gases from the process equipment.

Response: The fact that Test Method 106 is to be used to determine compliance with §§61.62(a) and 61.63(a) and that Test Method 106 is a stack testing method with a minimum sampling time of an hour indirectly excludes fugitive emissions such as leaks from valve stem packing and flange gaskets from applicability of the 10 ppm standard. Adding a statement to the effect that only "stacks and vents used specifically for purposes of discharging vinyl chloride-containing gases" could result in additional uncertainities. For example, the specific purpose of a stack may be to vent ethylene dichloride, but vinyl chloride may also be a pollutant in the gas stream. Or the primary purpose of a vent may be to remove heat.

3. VC-26

Comment: The 10 ppm maximum vinyl chloride emission limits for the low volume ethylene dichloride purification and vinyl chloride formation and purification stacks are not realistic. To get down to 10 ppm would require at a minimum the use of carbon adsorption. Since EPA uses a cost benefit ratio to justify the 0.02 lbs/100 lbs of product for the oxychlorination process, it seems more realistic to apply this same weight standard to all of the stacks.

Response: The primary reason for making the standard for the oxychlorination process less stringent than for the other emission points is the large energy expenditure that would be required at many plants to reduce the oxychlorination process emissions to 10 ppm. Little, if any fuel, is required for incineration of emissions from the ethylene dichloride purification and vinyl chloride formation and purification processes. Furthermore, the uncontrolled emissions from these two processes.

processes are a much larger percentage of the total emissions from an average plant than those from the oxychlorination process. The incinerator tested by EPA is controlling the ethylene dichloride purification and vinyl chloride formation and purification process and meets the 10 ppm limit.

4. VC-18

Comment: During formation of vinyl chloride, there is a column to separate by-product HCl from the vinyl chloride. The HCl overhead in this column is ducted to the oxychlorination process. During upsets of this system, HCl must be vented to the atmosphere. This stream contains about 30 ppm of vinyl chloride. We estimate this venting occurs about five times per year releasing 12.15 kg (27 lbs) of vinyl chloride per year. Removing this small amount of vinyl chloride will increase the cost of our control device $500,000. This stream should be exempted from §61.63(a).

Response: EPA has discussed this problem with two other companies. Both of these companies avoid venting the HCl stream to the atmosphere by operating the cracking furnaces only when the oxychlorination process is operating.

5. VC-35

Comment: The 10 ppm limit for vinyl chloride emissions from the various control equipment should specifically mention that it is to be determined prior to mixing with other gases.

Response: On October 14, 1975 (40 FR 48299) §61.17 was added to Subpart A - General Provisions of Part 61. Section 61.17 (entitled "Circumvention") prevents an owner or operator from building, erecting, installing, or using any article, machine, equipment, process, or method, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Dilution would be a method of concealing an emission which would otherwise constitute a violation of an applicable standard.

6. VC-18, VC-21, VC-25, VC-29, VC-34

Comment: An averaging time of 30 days should be provided for the 10 ppm limit for stack emissions. Otherwise multiple back-up systems will have to be employed at a grossly disproportionate cost in order to meet the 10 ppm limit on an instantaneous basis.

Response: The standard does provide for an averaging time of at least three hours. Section 61.67 states that an emission test is to consist of three runs. Each run is to be an hour in length. The continuous monitor provides an indication of instantaneous emissions, but will not be used to determine compliance.

2.4.2 §61.62(b)

1. VC-23

Comment: EPA proposed a less stringent standard than can be met by incineration for the oxychlorination reactor because of the large fuel penalty that would be incurred to incinerate the emissions from that source. Afterburners designed especially for these plants can attain substantial heat recovery, and catalytic afterburners offer energy savings by being able to operate at lower temperatures than conventional units. The use of afterburners (and scrubbers) to control emissions from oxychlorination reactors should be required. The price of fuel will be sufficient incentive for plants to install well-designed systems.

Response: EPA recognizes that two plants are using afterburners for control of the oxychlorination reactor. In both cases, the plants are reducing the large volume gas stream and thus the high energy costs by recycling the process gas stream and using oxygen instead of air to feed into the process. Although the cost of fuel does provide incentive to install this kind of system, there are several types of oxychlorination reactors and EPA does not know whether this system could be adapted to all the reactor types within the time available for compliance. A catalytic oxidation unit has been used in a pilot study for the oxychlorination process, but it has not been used commercially. It should be emphasized that energy is only one factor in EPA's decision. At most plants the oxychlorination reactor is a relatively small portion of the total emissions. At the one plant where the oxychlorination reactor has relatively significant emissions, the incineration may have to be used if a change in process variables will not result in the plant meeting the standard.

2. VC-28

Comment: To meet the 0.02 kg/100 kg limit, more than a change in process variables will be required. The standard should be set slightly higher to avoid the use of incinerators or an additional reactor in the oxychlorination process.

Response: The additional reactor in the oxychlorination process, which is being used by several plants, does not require a large expenditure of energy as does an incinerator. If the additional reactor is required to meet the .02 kg/100 kg requirement, there is no apparent reason why it should not be used.

3. VC-27

Comment: The preamble to the proposed standard states that "... as technologies using less energy for controlling the oxychlorination reactor are developed, EPA will evaluate the desirability of proposing standards which would require a higher degree of control at all plants." The possibility of more stringent regulation as technologies might develop forces serious evaluation of the prudence of current prompt investment and emission control efforts which might be rendered obsolete in the future, without due consideration of ambient air emission levels then existent and further assessment of the results of substantial efforts now underway to quantify health risks at very low exposure levels.

Response: It is EPA's responsibility to examine new technology as it is developed and revise its standards accordingly. If EPA developed a more stringent standard for the oxychlorination reactor, it would also look at the impact of adopting that standard for existing plants. Depending on these impacts, EPA may apply the standard only to new plants by developing the standard under section 111 of the Act.

2.4.3 §61.64(a)(2)

1. VC-29, VC-22

Comment: The inclusion of the words "is open and" in the last sentence of §61.64(b), (c), and (d) is inconsistent with the wording "before opening" in §61.65 (b)(6)(i) to which this sentence applies. For clarity and to resolve this discrepancy, the last sentence of §61.64(b) should be reworded as follows: "This requrement does not apply to equipment that meets the requirement in §61.65(b)(6)(i)."

Response: The commentator's suggestion does not appear to clarify the sentence. This is exemplified by inserting his suggestion in the last sentences of §§61.64(b), (c), and (d). They would then essentially read as follows: "The 10 ppm requirement does not apply to equipment that before it is opened the quantity of vinyl chloride is to be reduced so that the equipment contains no more than 2.0 percent by volume vinyl chloride ... etc." The intent of the last sentence of §61.64(b), (c), and (d) is to say that the 10 ppm requirement does not apply to equipment that is open and has already met the requirement in §61.65(b)(6)(i) before it was opened. In other words, the standard does not apply to equipment which is not in operation. In the promulgated standard, the last sentence in the proposal §61.64(b) has been changed to: "This requirement does not apply to equipment that is open and out of operation and that met the requirement in §61.65(b)(6)(i) before it was opened."

2. VC-13, VC-21, VC-25, VC-29, VC-33, VC-34

Comment: The reactor opening emission limitation should be changed to permit averaging all reactor openings over a 30-day period. In the case of the reactor opening limitation, the requirement that each reactor opening must meet the limitation is burdensome and, in addition, may cause hazardous situations. EPA has discussed in the SSEIS, Vol. I on page 4-71 its logic in developing the standard. It requires that each reactor run an average of 3.5 batches before opening and cleaning. The rate of fouling and/or the need for cleaning varies from one resin recipe to another. Traditionally, on the completion of each batch, the plant operator has made a judgment based on inspection, heat transfer, equipment condition or history as to whether the reactor should make another batch or whether it should be cleaned. Failure to clean at the proper time leads to a high percentage of runaway reactions and emergency venting to the air. Cleaning too often is costly and results in higher emissions. The proposed standard requires multiple batches between each opening and cleaning; thus, a plant operator with a reactor that fouls after one batch must choose between violating the standard or operating a reactor in an unsafe manner.

Response: The averaging time for reactor opening has not been increased in the promulgated standard. In the SSEIS, Vol. I several ways of meeting the reactor opening emission limit were mentioned. One of these is to reduce the number of reactor openings. Another is to evacuate the reactor before opening it.

3. VC-21, VC-22, VC-29

Comment: There is an error in calculating the emission factor for 8000 ppm vinyl chloride monomer in reactor openings. The concentration should be converted to weight percent before the emission factor is derived.

Response: The calculation was provided by a company and should have been converted to a weight basis. Recalculation gives a correction emission factor of 0.002 kg vinyl chloride/100 kg polyvinyl chloride. The standard has been changed to reflect this correction.

2.4.4 §61.64(e)

1. VC-22, VC-24, VC-28, VC-29

Comment: The proposed standard requiring that dispersion resins be stripped to 2000 ppm is too stringent. EPA recognized the greater difficulty in stripping dispersion resins and the existing state of technology relating to stripping of dispersion resins. EPA also recognized in the preamble to the proposed standard that achievement of the requirements for dispersion resins depends on development of more advanced control technology in the period subsequent to the promulgation of the standard and prior to the effective date of some of its provisions.

Extensive scientific research is presently being conducted to develop this control technology and these efforts have been successful for many dispersion resin products. However, after more than ten months of concentrated research, there still remain several dispersion resin products which cannot be stripped to 2000 ppm residual vinyl chloride. Stripping capability for these dispersion resins range from 3000 to 10,000 ppm residual vinyl chloride. It now appears uncertain that sufficient time remains to allow development, engineering, equipment procurement, installation, and demonstration of the necessary stripping equipment within the maximum compliance time. Due to these factors, EPA should give additional consideration to the standard for dispersion resins prior to promulgation of the final standard.

Specifically, the industry requests the allowable residual vinyl chloride content of certain dispersion resins to be set at 6,000 ppm. The specific dispersion resins to which this 6,000 ppm limit should apply shall be based on a manufacturers demonstration that specific resins cannot be stripped on a commercial scale of 2,000 ppm. The industry pledges its efforts to continue researching methods of stripping all dispersion resins to a residual vinyl chloride level of 2,000 ppm or less and invites EPA to reevaluate the status of dispersion resin stripping technology in mid-1978 and to amend the regulation as appropriate.

Response: EPA also recognized in the preamble to the proposed standard that some grades of resins are more difficult to strip than others. Therefore, rather than requiring that each grade of dispersion resins be stripped to 2,000 ppm, the proposed standard permits industry to average different grades of dispersion resins together over a 24-hour period. Only one of the eight manufacturers of dispersion resins specifically commented that the dispersion resin standard should be made less stringent. Only two of several grades of dispersion resins made by this company cannot meet the 2,000 ppm limit. In considering this information and the information obtained prior to proposal of the standard, EPA has decided that making the standard less stringent is not warranted.

2. VC-44

Comment: The proposed standard for dispersion resins is not stringent enough. There appears to be a technical inconsistency in the fact that the dispersion resins cannot be stripped to less than 2,000 ppm and yet they are easily "stripped" in the dryer with the monomer discharging into the air. Since the mass transfer of monomer through the polymer is, undoubtedly, the limiting factor in each case, it would seem that additional product exposure time in the "stripper" could produce a concentration lower than 2,000 ppm. The conclusion drawn by EPA that 2,000 ppm will reflect the best available control technology in "2 1/2 years" seems pessimistic. If this limit is set at 2,000 ppm, there will be no incentive to reduce it further.

Response: The primary difference between the polymerization of dispersion resins and other resins is the relatively large amounts of emulsifying agent used in the polymerization of dispersion resins. The emulsifying agent combined with strong agitation prevent coalescence of the polymer particles. This results in smaller particles than are obtained by other polymerization processes. High temperatures cannot be used in the stripping process because this would cause coalescence of the particles and thus degradation of the final product. Prolonged stripping causes discoloration of the final product.

There is a difference in the conditions between the stripper and the dryer which affects the transfer of vinyl chloride out of the resin. In the stripper the resin is surrounded by water which tends to inhibit the release of the vinyl chloride from the resin. The vinyl chloride would have to move out of the resin into the water and then into the vapor space above the water. The drying of dispersion resin takes place in a spray dryer, where the small resin particles are atomized. Each particle is therefore exposed to a large surface area in the dryer. The water is evaporated off the particle. This eases the escape of vinyl chloride from the particle.

3. VC-20

Comment: It is not clear how the residual amount of vinyl chloride in the dispersion resin has a significant bearing on stack emissions from process equipment. It would appear that steps can be taken without significant additional cost to reduce stack emissions from process equipment for dispersion resins to the same levels as the other resins.

EPA should emphasize the importance of special handling required for dispersion resins which have a 2,000 ppm vinyl chloride content. EPA should also announce a schedule requiring industry to reduce vinyl chloride levels in dispersion resins.

Response: The emissions from stacks on dryers, silos, and other process equipment following the stripping operation are due to residual vinyl chloride in the dispersion resin. These emissions can be controlled in two ways. Either more vinyl chloride can be stripped out of the resin or control equipment can be placed on the stack. As explained in the preamble to the proposed standard, dispersion resins are more difficult to strip than other resins. Also, a different kind of dryer is used in the manufacture of dispersion resins than is used for other resins. This dryer uses larger volumes of air than the other dryers. A control device reducing the effluent to a given concentration therefore does not reduce the mass emissions from a dryer at a dispersion resin plant as low as at other resin plants. At dispersion resin plants, add-on control devices achieve about the same degree of emission reduction as stripping to 2,000 ppm. So there is no advantage to requiring add-on controls. The cost of add-on controls at an average dispersion plant is significantly higher than improved stripping. For improved stripping, the installed capital cost is $3,319,000 and the total annualized cost is $1,363,000. For incineration, the installed capital cost is $5,287,000 and the total annualized cost is $4,892,000.

EPA investigated the possibility of reducing the air volume from dispersion resin dryers by a recirculation system. This does not appear to be a practical solution.

In regard to special handling for dispersion resins, when the processing (drying) of dispersion resins is completed, the product contains no more residual vinyl chloride than other resin types. There is no provision under section 112 of the Act for setting up a schedule for reducing vinyl chloride levels in dispersion resins. EPA can, however, review the status of control at a later time and revise the standard as appropriate.

4. VC-40

Comment: Allowing averaging of different resin grades is unfair to a small polyvinyl chloride plant that makes only one resin grade. The resin made by this company is a copolymer and is more difficult to strip than homopolymer. Other producers have the flexibility of being able to average together homopolymers and copolymers.

Response: EPA agrees that the averaging concept does favor the larger plant making a variety of resin grades. However, EPA contacted another company which manufactures the same copolymer as the commentator. This copolymer is essentially the only resin produced at one of its plants. The company reported wide variations among batches with regard to the degree of stripping that is achieved. However, over a 24-hour period there are a large number of batches produced and the average of all batches consistently meets the 400 ppm limit. Differences in recipes used at different plants, however, can affect the stripping levels achieved. Considering this information and the fact that the averaging concept does provide needed flexibility for the industry as a whole, EPA has not removed the provision for averaging from the standard.

5. VC-25

Comment: In the preamble to the proposed standard, EPA stated that "since stripping technology is currently in the development stage, it is possible that lower levels of emissions will be achievable before promulgation of the proposed standard. Interested parties are invited to submit during the comment period factual data on the status of stripping technology." Commentator VC-25 believes that EPA should not lower the 400 ppm proposal for stripping for two reasons:

(1) It would disrupt the industry's on-going plans to comply with the proposal. It takes time and major new capital investment to design, purchase, and construct necessary equipment and facilities. In many cases the two-year statutory limit for waivers is not adequate to carry out a major change.

(2) There is a lot of variation in the degree to which resins can be stripped. The company represented by the commentator has directed its own research organization to seek improvements in its stripping technology and has actively sought information on various technologies. While many of these technologies offer some advantages in special areas and products, there is no universal technology for all plants, products, and processes. Within the commentator's own processes and plants, he has observed a variation in stripping of residual vinyl chloride monomer from 5 ppm to 600 ppm, exclusive of the dispersion resins which meet the 2,000 ppm limit proposed in the standard. The commentator is experiencing great difficulty in achieving the 400 ppm limit for copolymer resins. Currently, these are in the 400 ppm to 600 ppm residual vinyl chloride range.

Response: EPA has decided not to reduce the 400 ppm limit at this time. It appears that some resins can be stripped to much lower levels than others. Copolymers appear to be more difficult to strip than homopolymers. Because of this variation, data on stripping levels for different products would have to be obtained. Substantial reduction in the 400 ppm limit would probably require reproposal of the standard for public comment. This would delay the implementation of any standard. EPA has decided that revision to the 400 ppm limit, if any, will take place at a later date after promulgation of the 400 ppm limit. EPA's decision to not reduce the 400 ppm limit in no way suggests that States are to be discouraged from doing so as newer technology is developed.

6. VC-42

Comment: The proposed level of 400 ppm may be satisfactory in the initial control; however, it should be pointed out that information available in the literature indicates that residual concentrations considerably below 400 ppm are achievable in some types of polyvinyl chloride resins. Diamond Shamrock and B. F. Goodrich report achievable levels which indicate that the figure 400 ppm could be lowered to 100 ppm or less for some resins.

Response: Same as #5.

7. VC-28

Comment: The preamble to the proposed standard suggests that stripping technology can be developed within two years following promulgation of the standard. This assumes that a plant can get a waiver of compliance. There is no guarantee that an existing plant can obtain a waiver. Also, newly constructed plants cannot obtain waivers and would have to meet the 2000 ppm limit within 90 days of start-up. This would deter construction of new plants.

Response: It is true that there is no guarantee that a waiver would be granted to allow the development of stripping technology for dispersion resins. However, it is likely that EPA would grant resin manufacturers the maximum two years to comply with the stripping part of the standard if they complied with the other provisions of the standard and reduced the vinyl chloride levels in the resin as much as possible in the two year period. This was a consideration in EPA's decision to base the standard on developing technology rather than on technology available at the time that the standard was being developed.

With regard to newly constructed plants, it is true that section 112 does not provide for waivers of compliance. A "new source" is defined in §61.02 of the General Provisions as a stationary source, the construction or modification of which is commenced after the proposal of the standard. The owner or operator constructing a new source would therefore be aware of the requirements of the standard before construction is commenced. Whereas the owner or operator of an existing source would have to retrofit a plant to meet the standard, it would appear that the owner or operator of a source undergoing construction can more readily design that source to meet the standard. It seems appropriate to prohibit newly constructed sources from operating out of compliance with the standard.

8. VC-13, VC-18, VC-21, VC-29

Comment: The intent of the standard is that once the polyvinyl chloride resin has been stripped to 400 or 2000 ppm, as appropriate, all of the emission requirements from that point on in the process have been met. Two changes in wording should be made to make the standard consistent with this intention.

First, after the resin has been stripped to 400 ppm or 2000 ppm, the plant owner or operator should be able to open the stripper with the resin in it without having to meet the "opening of equipment" requirement in §61.65(b)(6). The vinyl chloride which escapes from the resin into the vapor space above the resin should be exempted from meeting the "opening of equipment" requirement.

Second, the standard now requires that the resin be sampled "as it is transferred out of the stripper." This phrase should be removed so that a plant owner or operator can measure the resin in the stripper and then be able to carry out additional functions in the stripper without meeting additional emission requirements before transferring the resin out of the stripper.

Response: EPA agrees that the intention of the standard is to limit emissions from all operations following the stripping operation to 0.04 or 0.2 kg/100 kg product, as appropriate. Therefore, the standard has been revised so that samples of the resin are to be taken immediately after the stripping is completed. If the sample contains no more than 400 or 2000 ppm, as appropriate, operations beyond the stripping operation are in compliance with the standard even if those operations take place in the stripper. Also, after the stripping is completed, if the stripper is to be opened, the vapor space above the resin in the stripper must not exceed "the opening of equipment standard." After it has been established that the resin meets the 400 or 2000 ppm requirement, vinyl chloride escaping into the vapor space will not have to meet the opening of equipment standard. In the case where stripping is done in the reactor, the same principle applies, except that the vapor space above the resin has to meet the "reactor opening" requirement immediately after stripping.

9. VC-34

Comment: A paragraph should be added to §61.64(e) to permit the use of control devices in lieu of stripping to meet the requirement for sources following the stripper in polyvinyl chloride plants.

Response: This provision has already been made in §61.64(e)(2).

10. VC-12

Comment: The vinyl chloride emission sources following the stripper should also have vinyl chloride emission limits in addition to residual vinyl chloride limits in the processed vinyl chloride resin. Emission sources following the polyvinyl chloride resin stripper account for 46 percent of a polyvinyl chloride plant's vinyl chloride emissions. It is important to have emission standards that can be readily measured and enforced for these emission sources.

Response: Stripping the residual vinyl chloride content of dispersion resins to 2000 ppm and other resins to 400 ppm achieves essentially the same amount of emission reduction from sources following the stripper as installing add-on control devices. Therefore, there is no benefit in requiring add-on control devices as well as stripping.

With regard to the enforcement aspects, there are multiple stacks on the sources following the stripper. Essentially all the emissions from these stacks are due to vinyl chloride left in the resin after it is stripped. Measuring the residual vinyl chloride in a sample of stripped resin is much easier than measuring the emissions from multiple sources following the stripper, and provides the same information.

11. VC-21, VC-22, VC-25, VC-29, VC-31, VC-35

The proposed standard requires that in the case where continuous stripping is used, "one representative sample of polyvinyl chloride resin is to be taken for each grade of resin processed or at intervals of 8 hours for each grade of resin which is being processed, whichever is more frequent."

VC-21, VC-22, and VC-29 request that the 8 hour requirement be changed to 24 hours. The rationale for this request is that instrument charts for a continuous stripper reflect adequately the degree of control attained over the process, and in a system operating properly, a single sample per day is adequate.

VC-25 requests that for batch stripping one sample be taken at random for each eight hours of operation. The rationale for this request is that the proposed standard discriminates against a plant which strips batchwise as opposed to a plant which has continuous stripping. The plant with batch stripping would have to analyze more samples.

VC-31 requests that samples be required only once per day.

According to VC-35, there are no criteria or guidelines provided for determining the number of strippers and samples and the types and grades of resin to be sampled for each individual plant. Therefore, the standard is vague and may be left open to negotiation.

Response: The proposed standard requires that the vinyl chloride in the stripped slurry samples be measured both during the initial emission testing within 90 days of the effective date (unless a waiver of compliance is obtained) and on a continuous basis. There are no criteria or guidelines provided for determining the number of strippers and samples and the types and grades of resin to be sampled during the initial testing period. At one time, EPA considered requiring one sample of each grade and type of resin manufactured at the plant. However, this could be disruptive to production schedules and does not seem necessary because of the continuous sampling required. For the continuous sampling, there are specific requirements. One sample is to be taken for each batch of each grade and type of resin stripped. One sample is required for each batch of resin stripped because the degree of emission reduction achieved through stripping is primarily dependent on the procedures carried out rather than a control device. The vinyl chloride levels in the stripped resins are permitted to be averaged over a 24-hour period. A daily resin sample would give no assurance that the 24-hour average level was being met on a continuous basis.

12. VC-25, VC-29, VC-34

Comment: Increase the averaging time for stripping from 24 hours to 30 days. With the 24 hour averaging time, a plant manager would have to balance production based on meeting the standard rather than on what customers had ordered.

Response: As stated in the preamble to the proposed standard, EPA rejected the option of extending the averaging time to a month because this would permit higher peak emission levels than averaging on a 24-hour basis. EPA has already provided the industry with considerable flexibility by allowing an averaging time of 24 hours.

2.4.5 §61.65(a)

1. VC-21, VC-26, VC-29, VC-31

Comment: A zero emission limit is proposed for relief discharges which can be prevented. According to the preamble to the proposed standard, operator error is to be considered preventable. This statement goes beyond normal legal responsibility based on negligence. A plant manager may be held responsible only if an operator is improperly trained. Errors in human judgment, however, are beyond complete prevention.

Response: Whether an operator error will be considered preventable or not will have to be decided on an individual basis depending on the surrounding circumstances. Examples of preventable operator errors would be errors due to lack of training or negligence.

2. VC-42

Comment: It is recommended that §61.65(a) on relief valve discharges be amended to require that all relief valves in vinyl chloride service in ethylene dichloride, vinyl chloride, and polyvinyl chloride plants be required to discharge to flares capable of combusting all vinyl chloride received.

Response: There are several ways of limiting relief valve discharges to the atmosphere. One of these is flares. EPA is concerned only that these discharges are eliminated. If a plant successfully employs other methods to prevent the discharges, there is no apparent reason to require flares in addition to the other methods.

3. VC-20

Comment: EPA should require the owner or operator to report by telephone any emergency discharge into the atmosphere from relief valves immediately rather than within 10 days, to be followed by a complete written report of the accident within 10 days.

Response: There is no apparent benefit to be gained by requiring the plant to immediately report a discharge. This would not result in reduced emissions or reduced community exposure. Enforcement action would await the written report in 10 days anyway.

4. VC-18

Comment: Thermal relief valves activate very seldom and emit little vinyl chloride when they do. Some of these are located in remote parts of the plant and can be tied into a control device only with difficulty. The benefit for doing this will be insignificant. EPA should exempt these remote thermal relief valves from the discharge and reporting requirements of §61.65(a) but continue to include them under §61.65(b)(4).

Response: The proposed standard for relief valve discharges applies to all relief valves on equipment in vinyl chloride service. EPA is aware that some relief valves discharge more frequently than others. However, the goal of the standard is to prevent all discharges. The standard does not require that the relief valves be tied into a control device. They can be tied into a piece of equipment such as a distillation column, for example.

5. VC-24

Comment: §61.65(a) should be amended to clarify that the term "emergency relief discharge" includes steps necessary to repair damage occurring as a result of such discharges and that such steps should not be subject to the emission limitations contained in the regulations. For example, a rupture disk will be damaged as a result of a discharge from an emergency system. Steps taken to replace the rupture disk could involve evacuation of a portion of the vinyl chloride remaining in the equipment. The limitation upon emissions from opening of equipment should not apply to this situation.

Response: Steps necessary to repair damage occurring as a result of emergency relief discharges are not exempt from emission limitations contained in the regulations. Emergency relief discharges are discharges which cannot be prevented. Steps taken to repair damage after a discharge are deliberate and planned and the emissions can be prevented or at least reduced.

6. VC-39

The proposed standard defines "emergency relief discharge" as a discharge which could not have been avoided by taking all available measures to prevent the discharge." (Emphasis added) Our contention is that our facility contains sufficient features to satisfy the "all available measures" provision. The following is a summary of the features in our polyvinyl chloride plant which collectively prevent reactor relief valve discharges.

1. Computer control with automatic transfer to back-up computer.
2. Total back-up analog instrumentation with the "bumpless" transfer.
3. Two sources of electric power.
4. Two emergency generators.
5. Automatic restart of critical motors following a power interruption.
6. A 200,000 gallon reservoir of refrigerated water for controlling reactor temperature.
7. Inverter powered control of instruments and computer.
8. Computer actuated chemical system for stopping the polymerization reaction.
9. Computer controlled peak shaving system for reduction of excess reactor pressure.
10. Use of a reactor size vessel in the recovery system for collection of gas surges and thus prevention of reactor over-pressuring.

11. Computer monitoring and alarm of pressure and temperature for abnormal conditions.

12. Computer automatically starts maximum cooling water to the reactor if the pressure reaches a specified level.

13. Computer shuts off all reactor charging operations if a high level occurs.

As can be seen from the above list, we feel we have provided many features not mentioned in the regulations.

In §61.65(a) "necessary" should be substituted for "all available" as follows:

"An emergency relief discharge means a discharge which could not have been avoided by taking (all available) necessary measures to prevent the significant likelihood of a discharge.

Response: The standard has been revised by deleting "all available" measures." EPA has listed several methods which it expects a plant to take in preventing discharges. EPA's primary concern is that the discharges are prevented. If a company has alternate methods which do prevent discharges, these are acceptable to EPA.

2.4.6 §61.65(b)(1)

1. VC-21, VC-24

Comment: The emissions from loading and unloading lines are insignificant. Section 61.65(b)(1)(i) imposes too stringent a limitation upon emissions from loading and unloading lines. VC-21 states that the allowable vent from three cars a day at an average-sized polyvinyl chloride plant with small cars will be 0.09 kg (0.2 lbs). Using 7.6 meter (25 foot) connecting hoses with three cars a day the vent at 760 mm pressure would be less than 0.9 kg (2 lbs) per day. The extra handling necessary with valve-to-valve coupling at the car is hardly worthwhile. VC-24 states that the necessity for connecting the unloading line to a pressure or vacuum source in order to comply with the proposed standard creates increased danger of an uncontrollable discharge of vinyl chloride.

Response: The quantity of emissions from each fugitive emission source may appear to be relatively small, but is being regulated because when the emissions from all the sources are considered together, they are relatively large. EPA feels that best control technology has been considered in developing this section of the proposed standard and that the increased danger of vinyl chloride monomer discharge is minimal.

2. VC-31

Comment: The requirement for loading and unloading lines should not be applied to pipeline delivery of vinyl chloride. To obtain a residual of as little as 0.0038 m^3 (0.13 ft^3) of vinyl chloride in a substantial length of pipe would be exceedingly difficult. Moreover, it does not seem necessary since they are not disconnected and opened with each loading and unloading.

Before opening a pipeline to make repairs (necessitated by a leak or corrosion, for example), the line is purged and drained of its contents to eliminate fire hazards. This is done by evacuating the residual vinyl chloride vapor in a long pipeline below 2 percent of its volume, except by venting to the atmosphere. Achieving the 0.0038 m^3 residual level would require the installation of a number of valves. Proper design, however, requires that the number of valves be kept at a minimum, since valves are a principal source of fugitive emissions in a pipeline.

The standard for unloading lines and loading lines should be changed so that the vinyl chloride has to be reduced to 0.0038 m^3 or 2 percent, whichever is greater.

Response: Since pipelines are not opened on a routine basis, the standard has been revised to exclude them from meeting the requirement for unloading and loading lines in §61.65(b)(1). When pipelines are opened, they are required to meet the opening of equipment standard in §61.65(b)(6).

3. VC-36

Comment: Unloading lines from river barges should be given special consideration due to the greater volume of vinyl chloride unloaded from a barge compared with a rail car or truck. A sentence should be added to §61.65(b)(1)(i) so that the vinyl chloride in unloading lines from barges would have to be reduced to 0.0038 m^3 (0.13 ft^3) at standard temperature and pressure per 225,000 kg (500,000 lb) of vinyl chloride unloaded.

Response: The standard is based on best control technology to minimize emissions. The standard as a whole will result in greater emissions from a larger plant than from a small plant. The same principle applies to unloading lines.

2.4.7 §61.65(b)(3)

1. VC-21, VC-25, VC-29

Comment: No account has been taken of the use of reciprocating compressors which are widely used in the industry. Section 61.65 (b)(3)(iii) should be retitled "Rotating Compressors" and a new paragraph (b)(3)(iv) should be inserted entitled "Reciprocating Compressors" with wording essentially the same as paragraph (b)(3)(ii).

Response: This provision has been added to the promulgated standard.

2. VC-24

Comment: §61.65(b)(3) should contain additional language to the effect that direct venting of gases from seals to a control device is equivalent to utilization of double mechanical seals. The general provisions for demonstration of equivalent emission control equipment would require a decision by the Administrator for each plant. This process is cumbersome and unnecessary.

Response: The two are not equivalent. Control devices control to around 10 ppm while a properly operated double mechanical seal would have essentially no emission losses.

3. VC-25, VC-27

Comment: EPA should withdraw the requirement of using double mechanical seal pumps in place of single seal pumps now used. According to VC-25, this could be done by limiting the requirement for double mechanical seals to pumps handling liquids containing more than 50 percent vinyl chloride by weight (rather than 10 percent, as proposed). This should be done for several reasons:

(1) The emissions from a single mechanical seal pump are very small. An average single pump with a single mechanical seal and handling refined vinyl chloride would emit only 0.0033 percent of the 16 kg/hr which EPA calculates an average plant will emit after the standard is in effect. A single pump with a single mechanical seal pumping a liquid containing 10 percent by weight vinyl chloride would emit 0.00033 percent of the target 16 kg/hr.

(2) Single mechanical seals have a reliability factor of 0.90 - 0.95, if properly fitted for vinyl chloride service. Double mechanical seals and their attendant flush holders, filters and gauges are estimated to have an overall system reliability of 0.70 - 0.80. To insure the integrity of the overall unit, redundancy of such pump systems would be required, with comparatively insignificant reduction of vinyl chloride emissions estimated to result.

Mechanical seal systems on resin slurries and solutions are even more prone to failure than average because the resinous materials tend to foul the pressure springs and the moveable seal face preventing proper automatic wear adjustment. The proposal to limit the use of double mechanical seals for liquids containing 50 percent or more vinyl chloride would exempt resin slurry or solution pumps from regulation.

(3) In the case of pumps required to transfer specification quality vinyl chloride through pipelines in the process unit or in loading operations, the inclusion of minute quantities of "an environmentally acceptable fluid such as ethylene dichloride" designed to flow into the pump, not out of the pump," would obviously contaminate the product and require purification facilities to remove such impurities or the use of alternate means to preclude the possibility of product contamination. Such measures would be expensive and create operation monitoring parameters now not envisioned, with further high costs attendant with them.

Response: EPA is aware that each fugitive emission source, such as one pump, taken by itself causes relatively small emissions. Fugitive emissions considered as a whole are a significant source of emissions, and the goal of the standard is to reduce these.

The 10 percent figure was selected as a means of distinguishing between equipment which handles vinyl chloride and that which does not.

Double mechanical seal pumps are used industry-wide for emission reduction. Where these pumps are not applicable, sealless pumps have been used.

2.4.8 §61.65(b)(4)

1. VC-29, VC-22

Comment: Section 61.65(b)(4) requires the installation of a rupture disc preceding the relief valve on equipment in vinyl chloride service. The preamble to the proposed standard states that "an equivalent method of control would be to connect the discharge line from a relief valve to process equipment or to a recovery system." This stated equivalent method should be included as part of the regulation so that the regulation would be complete in itself and not be dependent on the preamble for interpretation.

Response: In accordance with this suggestion, §61.65(b)(4) has been modified as follows: "Vinyl chloride emissions due to leakage from each relief valve on equipment in vinyl chloride service are to be minimized by installing a rupture disc between the equipment and the relief valve, or by connecting the relief valve discharge to a process line or recovery system, or equivalent as provided in §61.66."

2. VC-25, VC-26

Comment: The requirement in §61.65(b)(4) for installation of rupture discs between relief valves and the equipment served by the relief valve should be removed, or revised to provide for the alternative of having a formal program of relief valve testing and maintenance. This should be done for several reasons.

(1) A properly selected, installed and maintained relief valve is less likely to leak than a rupture disc.

(2) The rupture disc prevents the relief valve from suffering premature lifting and also eliminates the chatter or sporadic relief that can occur when the vessel is near relief pressure and the valve doesn't reseat properly. However, when the rupture disc fails, pieces of the failed disc could more than likely wedge the relief valve open and cause relief valve failure. This, then, would cause the emission of more vinyl chloride than chattering or premature relief which can be cured by dropping system pressure.

(3) A dangerous situation will arise if the rupture disc slowly leaks vessel pressure into the space between it and the relief valve, thus effectively raising the relief pressure by 100 percent. Venting the space between the rupture disc and relief valve will avoid this situation, but creates another potential emission source.

Response: The proposed requirement for rupture discs is not being changed. There is apparently a difference in opinion as to whether relief valves leak more than rupture discs. Routine maintenance of relief valves may reduce leaks. However, in EPA's judgement relief valves do tend to leak more than rupture discs, and the addition of the rupture discs will reduce emissions. Preventing the leaks from relief valves in the first place appears to be a more efficient way of reducing emissions than detecting the leaks after they have already occurred.

In regard to the second point that pieces of a fragmented rupture disc can wedge relief valves open, modern rupture discs are designed so they do not fragment. Knife blades can be placed above the disc or the disc surface can be scored. When pressure is exerted on the disc, the disc divides into equal pie-shaped sections without fragmenting.

A slow leak between the rupture disc and the relief valve can be detected with a pressure gauge or by venting the space between the disc and valve and checking for leaks from the vent. Venting the space between the rupture disc and relief valve does create another potential source of emissions. However, since the rupture discs are less likely to leak than relief valves, the emissions from the vent are less than if there were no rupture disc.

3. VC-35

Comment: In addition to requiring the installation of a rupture disc between the equipment and the relief valve, a pressure gauge is recommended to be required between the rupture disc and the relief valve so that rupture disc leaks or ruptures are readily apparent, especially where relief valves may not relieve, yet leakage could occur and go undetected.

Response: The use of a pressure gauge between the rupture disc and the relief valve is recommended in the SSEIS, Vol. I. Pressure build-up between the rupture disc and relief valve could prevent the relief valve from relieving when it should. Therefore, the pressure gauge is needed to protect the equipment that is serviced by the relief valve. Since the pressure gauge is needed primarily for safety reasons rather than emission control, EPA has highly recommended it but does not require it.

2.4.9 §61.65(b)(5)

1. VC-14, VC-18, VC-21, VC-25, VC-26, VC-27, VC-28, VC-29, VC-34

Comment: A provision for emergency manual venting should be added to §61.65(b)(5). Discharges from relief valves in polyvinyl chloride plants are controlled by methods including, but not limited to, proper instrumentation, injection of chemicals, and the manual venting of gases to the monomer recovery system or other stand-by methods. Use of these techniques is the primary response to a reaction upset.

When these actions fail to establish desired temperature and pressure, a hazardous condition is created. As pressure and temperature rise toward relief ratings, the rate of reaction more than doubles for every 10°C rise and the degree of being out of control becomes a geometric progression. For this reason the quantity of vinyl chloride evaporated in order to gain control of the reaction at burst pressure is significantly greater than that needed to regain control at lower pressures and temperatures via the manual technique.

Use of manual venting to the atmosphere recognizes this problem and relies on vinyl chloride evaporation to cool the reactor contents. Manual venting can permit the reactor to be brought under control more quickly. Since the manual valve can be completely closed, a lower total quantity of vinyl chloride will be emitted to the atmosphere. Once a relief assembly, including rupture disc and relief valve, functions it is not certain that the relief valve will reseat; this would permit continuing emissions of vinyl chloride. It is estimated that manual venting will reduce potential emissions by 50 to 80 percent.

The proposed standard prohibits manual venting of vinyl chloride to the atmosphere, even in cases of extreme emergency. It is conceivable that there will arise on very infrequent occasions the necessity for doing this. An example could be in the case of failure of abatement equipment or very severe weather, such as a tornado, which has so badly damaged the plant that the installed safety equipment is inoperable, and manual venting of a small part of the reactor charge could prevent the uncontrolled venting of the entire charge. Such occurrences are not expected to happen more than once in a few years, but when they do, operators should not be forbidden to exercise good judgment. The required reactor chart record will show when this has happened, and the owner should report the occurrence, just as in the case of a relief valve release.

Accordingly, the use of manual venting to the atmosphere should be permitted after all normal controls have failed, but prior to the use of the last resort, the emergency relief device. It must be understood that this assembly is a primary device for preventing a major catastrophe, the rupture of a reactor.

It is not practical to construct a gasholder or abatement device large enough to handle all of the monomer from all of the reactors in a plant or even one large reactor.

VC-25 gave an example of how manual venting was used to control the pressure and temperature in a vinyl acetate copolymer reactor when the short stop addition system failed to function. The reactor became uncontrollable at 6:20 a.m. Two additions of refrigerated water failed to restore control. At 7:35 a.m., with the pressure at (195 psi) and rising sharply, the reactor was vented to the air. The reactor rupture disc would have failed at 220 psi anyway and no later than 7:40 a.m. based on the slope of the pressure curve. The material discharged from the vent was semi-solid; thus, any vent recovery system would shortly have been inoperative and the operating status of relief valves highly questionable.

Response. The standard has been revised to allow emergency manual venting. Emergency manual venting could be used in situations like the one where a tornado damaged the safety equipment in the plant, but not in situations like the one described by commentator VC-25. In the situation described by commentator VC-25, the reactor contents could be vented to a gasholder.

2.4.10 §61.65(b)(6)

1. VC-29

Comment: EPA discusses vacuum as a means of meeting the opening of equipment standard. The assumption that larger pressure vessels will withstand vacuum is incorrect. Many will not, despite a substantial pressure rating; this leaves water purge as the only practical method of gas removal. This can be very difficult on a remote tank in cold weather.

Response: These statements are correct. Even though these problems do exist, EPA feels that technology does exist for meeting this part of the standard and it should be used. Plants have several options for meeting the standard including the ones named and also purging with nitrogen.

2. VC-20

Comment: Fugitive emission sources are the largest sources of emissions to the atmosphere. We therefore question the rationale of the proposed standard which requires that the vinyl chloride concentration in process equipment greater than or equal to 5,500 liters in volume be reduced to two percent by volume at standard pressure and temperature before the equipment is opened to the atmosphere, and 110 liters of vinyl chloride at standard temperature and pressure for reactors smaller than 5,500 liters. There appears to be incongruity in logic to allow such high emissions from fugitive sources, the most important source, and only 10 ppm for other sources. EPA should also clarify how these measurements are to be made.

Response: There are three points made in the comment. The responses to these are as follows:

1. The cut-off point of 4.75 m^3 (5,500 liters) was chosen for several reasons which were explained in the preamble to the proposed standard. However, the cut-off point does not apply to reactors. Since reactors have traditionally been opened much more frequently than other process equipment, a separate standard was proposed for the opening of reactors in §61.64(a)(2).

2. The 10 ppm limit and the limits for opening of equipment are each based on best control technology. The 10 ppm limit is to be met through installation of control devices. The limits for opening of equipment are to be met by procedures such as evacuating or purging the vinyl chloride out of the equipment. The vinyl chloride removed from the equipment must also be treated in a control device

and meet the 10 ppm requirement. The overall mass emissions from opening of equipment will be smaller than the emissions from stacks meeting the 10 ppm requirement, because the equipment is opened on an infrequent basis for inspection and maintenance.

The emissions from opening of equipment can be calculated. If vacuum is used, for example, the calculation would be based on the number of evacuations, the vacuum involved, and the volume of gas in the vessel. If the vessel is purged, the vinyl chloride concentration in the equipment can be measured and the total vinyl chloride emissions calculated based on the volume of gas in the vessel.

2.4.11 §61.65(b)(7)

1. VC-21, VC-22, VC-25, VC-26, VC-27, VC-29

Comment: The use of the word "no" in §61.65(b)(7) is inappropriate because the prohibition is impractical, if not impossible to enforce. However, there is no argument with the spirit of the provision, and the following revision is suggested:

> "(7) Samples: Unused portions of vinyl chloride samples shall be returned to the process or to an abatement device, and sampling techniques shall be such that sample containers are purged into a closed process system."

Response: The suggested change has essentially been incorporated into the promulgated standard. This revision is only a change in wording and does not represent a change in the level of control required to meet the standard.

2. VC-18

Comment: This part should be changed to allow the plant to take vinyl chloride samples any way they choose so long as vinyl chloride emissions are minimized for instance by scrubbing them in a proper control device.

Response: The purpose of this section is to prevent emissions during the collection vinyl chloride samples. It is unclear how a control device could be used to achieve the same goal.

3. VC-29

Comment: The standard for sample flasks is applicable only to liquid chemicals such as vinyl chloride monomer sampling in vinyl chloride plants. Consideration should be given to routine and non-routine sampling. EPA should consider limiting the scope of this control to routine samples containing 20 percent or more vinyl chloride monomer by weight.

Response: The standard has been revised to cover samples containing 10 percent or more vinyl chloride by weight. This is consistent with the other fugitive emission regulations which apply to equipment "in vinyl chloride service."

2.4.12 §61.65(b)(8)

1. VC-43

Comment: A plant operated by the commentator produces a dry, unrefined ethylene dichloride product and any vinyl chloride produced is basically a minor by-product. The requirement for a continuous leak detection system, as described in §61.65(b)(8)(i-iii) is felt to be unnecessary and would serve a very limited function when compared to its cost, installation and maintenance. A periodic, manual monitoring program would be a more equitable alternative.

Response: The leak detection program is required only for equipment in vinyl chloride service. "In vinyl chloride service" means that a piece of equipment contains or contacts either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride. EPA has discussed this provision with the commentator. There is no equipment in this particular plant which is "in vinyl chloride service."

2. VC-31

Comment: The proposed standard does not give a clear definition of leak. By inference, any measurement by the vinyl chloride detection equipment which shows a higher background level than normal is construed to indicate a leak. A better proposal would be to define a leak as a measurement of greater than 25 ppm. This would minimize the continuous search for very small leaks which do not materially increase emissions.

Response: EPA considered including a definition for leak in the proposed standard. From an enforcement viewpoint this would be a preferable approach. However, the background concentrations in plants are expected to vary depending on the size of reactors, the age of the plant, the layout of the plant, and whether the plant is open or enclosed. The background concentrations are expected to decrease as engineering controls are implemented to meet the Occupational Safety and Health Administration standard. The higher the concentration defined as a leak, the less regulation of the smaller leaks. Twenty-five ppm is relatively high. EPA visited one newer plant which defined 0.5 ppm as a leak detection level. It is doubtful that this background concentration will be achieved at all plants by the time the standard is promulgated. Therefore, EPA has decided to define leak on a individual basis at each plant depending on the measured background concentrations.

3. VC-31

Comment: It is recommended that leak patrols using the portable monitoring system be done on a regularly scheduled basis rather than continuously. A weekly patrol should be adequate for this function with the detection equipment doing the monitoring between patrols.

Response: Both the proposed and promulgated standard require only that the portable hydrocarbon detector be used routinely rather than continuously to find small leaks.

4. VC-26

Comment: Preparation and submittal of a specific leak detection and elimination system within 45 days is a very short period. It should be extended to at least 120 days. The establishment of new monitoring points, assembly of equipment and training of laboratory personnel will require at least 4 months.

Response: The proposed and promulgated standards require only that a description of the leak detection and elimination program be submitted to EPA within 45 days after promulgation of the standard. This will allow EPA to review the program and approve or disapprove it before it has to be implemented. The program has to be implemented 90 days after the standard is promulgated.

5. VC-18

Comment: In §61.65(b)(8)(vi) the standard has a provision for each operator to develop a definition for a leak using some measure of vinyl chloride concentration above background levels in the fixed point monitoring system. This approach is inoperable because (1) changes in wind direction and other weather conditions will cause the background levels at some monitoring points to fluctuate widely and (2) the intermittent batch nature of normal polyvinyl chloride operations will cause wide variation of vinyl chloride concentrations depending on what operations are occurring. This will cause the background variation to be similar to the vinyl chloride increment measured when a leak occurred, so it would be difficult to separate a leak from fluctuation of the normal background. EPA should delete this section and let each plant handle how leaks shall be detected.

Response: In EPA's judgment, the fact that leak will be defined on an indivudual basis for each plant provides the flexibility needed to account for these variations.

6. VC-20

Comment: EPA should specify that companies are required to keep permanent records of the leak detection results. There should also be scheduled service, maintenance and calibration of leak detection equipment. These records must be subject to inspection upon request. EPA should also establish a level of vinyl chloride not to be exceeded and require reporting violations by the owner or operator when they occur.

Response: EPA requires that the records of leak detection results be kept for two years. The purpose of the leak detection program is to ensure that emissions from leaks are minimized by detecting them and correcting them as soon as possible after they occur. Keeping the leak detection results for longer than 2 years would not serve this purpose.

Section 61.65(b)(8) of the proposed standard requires that each leak detection program include a calibration and maintenance schedule for the leak detection program which is acceptable to the Administrator.

In the promulgated standard a sentence has been added which specifies that the continuous monitoring system is to be calibrated daily using the same calibration gases which are required for Test Method 106.

The reason EPA has not established a level of vinyl chloride not to be exceeded is explained in comment number 2 in this section. The standard does not require the owner or operator to call EPA when a leak is detected for several reasons. First, the purpose of the program is to find sources of leaks and redesign equipment to reduce leakage from these sources and to correct leaks that do occur as soon as possible. A plant owner does not violate the intent of the standard by having a leak, but by not correcting the leak. EPA expects leaks to occur. Also, leaks occur relatively frequently and it would be burdensome for both the plants and EPA if all the plants called EPA when a leak occurred.

2.4.13 §61.65(b)(9)

1. VC-14, VC-17, VC-18, VC-21, VC-22, VC-26, VC-28, VC-29

Comment: It is recommended that the first sentence of this section be changed to read as follows:

"The concentration of vinyl chloride in each inprocess wastewater stream containing greater than 100 ppm vinyl chloride measured immediately as it leaves a piece of equipment shall be reduced to less than 10 ppm by weight before being mixed with any other inprocess wastewater stream which is 10 ppm or less; before being exposed to the atmosphere; before being discharged to a wastewater treatment process; or before being discharged untreated as a wastewater. This paragraph does apply ..."

This change is proposed to clarify the standard. Presently the standard can be interpreted to require stripping all wastewater streams separately. The intent to prohibit compliance through dilution is retained in the revised wording. It is also requested that the 100 ppm be the cut-off point that determines which wastewater has to be treated.

Response: EPA agrees that §61.65(b)(9) needed to be clarified. The intent of the standard was to prevent dilution rather than require separate treatment of individual streams. The promulgated standard has been reworded as suggested, except that the 10 ppm cut-off point is retained.

2. VC-13, VC-21

Comment: According to commentator VC-13, the definition of "inprocess wastewater" would be more clear and concise if it was defined as "water which contains greater than 10 ppm of vinyl chloride as it leaves any piece of equipment." VC-21 suggests removing "or polyvinyl chloride" from the definition of "inprocess wastewater" because it has no meaning unless it says "polyvinyl chloride containing vinyl chloride."

Response: The purpose of the rather complicated definition of inprocess wastewater is to distinguish between wastewater that is covered by this standard and wastewater which is discharged to a receiving body and is subject to EPA's effluent guidelines and standards. "Polyvinyl chloride" is included in the definition because it is assumed that polyvinyl chloride always contains at least a trace of vinyl chloride.

3. VC-23

Comment: EPA proposes to limit the concentration of vinyl chloride in inprocess wastewater to 10 ppm or less. However, EPA has not sufficiently investigated the more attractive possibility of recycling inprocess wastewater.

Response: The 10 ppm limit provides incentive for recycling because of the cost involved in treating the water. See Section 2.8, Comment No. 1.

4. VC-14

Comment: As noted in the preamble, steam stripping is the most suitable device for reducing vinyl chloride in inprocess wastewater. Section 61.65(b)(9) requires that the overhead from the stripper be routed to a furnace for further treatment. Neither does the data contained in the SSEIS, Vol. I support, nor do we know of any data which supports, the achievement of a 10 ppm bottoms stream from a stripper which is also producing an overhead product suitable for incineration. The standard should be revised to require the concentration of vinyl chloride be reduced to 25 ppm instead of 10 ppm.

Response: If the overhead from the stripper alone cannot support combustion, it can be blended with concentrated hydrocarbon wastewater streams or supplemental fuel. It is not apparent how revising the standard to 25 ppm would solve this problem.

5. VC-37

Comment: Activated carbon is available as a method for reducing vinyl chloride concentrations in wastewater. A reliable manufacturer of resins who develops systems on a proprietary basis has informed me that a pilot plant has been effective in cleaning up ethylene dichloride (a closely related material) from water. With 0.2 percent (2000 ppm) in the intake wastewater they were able to clean the water up to 0.05 ppm and steam off the catch for reuse of the product gas and reuse of the resin. Because no bench or pilot tests have been run with vinyl chloride in wastewater, it is important that work be done at once with vinyl chloride.

Response: EPA appreciates the information provided by the commentator. Before making the emission limit for inprocess wastewater more stringent, and in effect requiring activated carbon as the control measure, as suggested by the commentator, EPA would have to conduct studies on the effectiveness of activated carbon on reducing vinyl chloride concentrations in water. This would delay standard setting. EPA may conduct these studies at a later date. Meanwhile plants could employ activated carbon instead of waste stripping to meet the standard.

2.4.14 §61.66

1. VC-32

Comment: The right to use equivalent methods should be indicated clearly in the standards without reliance on reference to the preamble. This is especially true in the area of analytical methods, where no two laboratories ever follow precisely the same techniques, and in methods used to reduce fugitive emissions. Insistence on a single method discourages innovation in the development of improved technology.

Response: Provision for equivalent control methods for fugitive emissions is included in §61.65(b) and §61.66 of the proposed standard. Provision for equivalent test methods is included in §61.67(g).

2. VC-24

Comment: The standard should include guidelines that the Administrator will use in determining that a proposed control method produces an equivalent emission reduction. A procedure for contesting this determination should also be specified.

Response: Since there are many parts of the standard where equivalent methods are allowed and because the nature of the equivalent methods is unknown at this time, it would be difficult to write guidelines which would be applicable to all situations. Providing for a procedure for contesting EPA's determination could indefinitately delay the installation of controls.

3. VC-18

Comment: A sentence should be added to §61.66 indicating that if EPA does not act upon a request for an equivalent control method within 90 days, the requesting operator should be allowed to proceed with his alternate.

Response: If an owner or operator chooses to request to use an equivalent method of control for initial compliance with the standard, he must do so within 30 days of the effective date. He should at the same time submit a request for waiver of compliance pursuant to section 112(c)(1)(B)(ii) of the Act. The request for waiver of compliance should provide for the case where a control method is determined not to be equivalent, and time is required to install another type of control. The two year deadline cannot be exceeded in any event.

Of course, an owner or operator can request to use an equivalent method sometime in the future to replace the method he used for initial compliance. In this case, there is no deadline for submitting a request for using an equivalent method. The old method of control can be used until EPA determines whether the new method is equivalent.

2.5 Testing, Reporting, Recordkeeping

2.5.1 §61.67

1. VC-13, VC-21, VC-26, VC-27, VC-29

Comment: Section 61.67(c) of the Emission Tests should be amended to eliminate the requirement that emission tests be conducted under the maximum production rate at which the equipment will be operated. The reason for the requested change is that the maximum production rate of a plant under optimum conditions may not be feasible or safe at the time of the test. Flexibility under conditions existing at the time must be allowed to insure that operator safety and public welfare is protected. Unique operating constraints may also require that tests be performed at levels well below maximum rates, owing to individual processes, which would require the Administrator's approval.

Response: The only scheduled emission test is the initial test that is required to show that the plant is in compliance. After that, tests are performed only at the request of EPA. Since tests are likely to be required relatively infrequently, it does not seem unreasonable to request a plant owner to schedule his operations as required for the test. The purpose of the test is to observe whether the control equipment is sufficient to keep the emissions below the standard when it is operating at its peak load. If the standard is met under these conditions, it can be more readily assumed that the standard is being met on a continuous basis. It should be noted that testing is not required during maximum operation of the equipment, but only "while the equipment being tested is operating at the maximum production rate at which the equipment will be operated." (emphasis added)

2. VC-11

Comment: In regard to the 10 ppm concentration standard for several of the stack emission sources, including the specifications for averaging time, oxygen content, and moisture content would clarify compliance determination.

Response: The averaging time is specified indirectly through Test Method 106. Section 61.67(a)(g)(1) specifies that Test Method 106 is to be used for those emission points that have a 10 ppm concentration limit. Test Method 106 requires that an integrated bag sample be collected for a minimum of one hour three times. This means that the emissions are averaged over a period of at least three hours. A specification has been added to the promulgated standard which would require that a time-weighted average be used, if the three runs are of different length. In the proposed standard, the concentration of vinyl chloride was to be corrected to 10 percent oxygen (wet basis) if combustion were used as the control measure. In the promulgated standard, this requirement has been expanded to all control measures.

3. VC-20, VC-25

Comment: The frequency of emission testing should be specified. Waivers should not be granted unless there are overriding or extenuating circumstances.

Response: Emission measurements are required on a continuous basis for reactor opening and stripping levels. For other stack emissions, the only scheduled emission test is the initial test required within 90 days of the effective date (unless a waiver is obtained). Any other testing required is at the discretion of EPA. For example, EPA may require an emission test for the monomer recovery system in a polyvinyl chloride plant if emission excursions are repeatedly measured by the continuous monitor. Waivers of emission testing are likely to be granted only in cases where EPA has other substantial evidence that emission requirements are being met.

4. VC-20 Comment: EPA should clarify how the owner or operator is to measure the amount of vinyl chloride in loading or unloading lines. EPA should also indicate how this will be enforced.

Response: There are several ways to meet the requirement for loading and unloading lines. The method for meeting the requirement is to be incorporated into a standard operating procedure which is available to EPA. The standard operating procedure is required to be available on a routine basis to those persons responsible for carrying out the procedure. Whether the method used meets the emission requirement can be determined by calculation. EPA can enforce the standard through inspection of the standard operating procedure, through inspection of the equipment used, and through observation of persons carrying out the procedure.

5. VC-25

Comment: It is not clear whether continuous measurement of emissions with a vinyl chloride detector is required or not. If an acceptable automatic vinyl chloride detector is in operation at a particular plant, emission tests should be waived.

Response: Continuous measurement of emissions with a vinyl chloride detector is required for the reactor; stripper; mixing; weighing and holding containers; monomer recovery system; ethylene dichloride purification; vinyl chloride formation and purification; oxychlorination reactor; and the control device used for captured fugitive emissions. The vinyl chloride detector is not a standardized reference method; it is to be used as an indicator of emission levels. Test Method 106 is required for emission testing to determine compliance because it is a standardized method.

6. VC-13, VC-18, VC-21, VC-22, VC-26, VC-27, VC-29

Comment: Section 61.67(e) requires that emission test results are to be determined within 30 days after the emission test and that the determinations are to be dispatched to EPA by registered mail the day following receipt of the determinations. This requirement should be changed so that the determinations are required to be reported to EPA by U. S. mail postmarked within 15 days following the determination. There is no urgency in reporting such data and, given the present state of our postal delivery system, there is no reason for registered mail.

Response: A source is supposed to be in compliance with the standard within 90 days of the promulgation of the standard. The proposed standard requires that the emission tests be done within the 90 day period, and permits an extra 30 days for determination of results. It seems unnecessary to allow two more weeks to mail the results. The purpose of using registered mail is to document the fact that emission data have been sent and received. This way if the results are lost in the mail, there will be no question that they were sent.

7. VC-13, VC-21, VC-22, VC-26, VC-27, VC-29, VC-30

Comment: It is recommended that paragraph (c) be changed so that a general rather than a detailed description of the method used or the procedure adopted to insure compliance with the standard is required. For many abatement systems employed in the industry, detailed descriptions of the equipment, the operating conditions, and the functional characteristics of the equipment are trade secrets and, in many cases, patentable technology. The use of this technology by other parties should be on a technology-fee basis which is established by the company developing the abatement equipment. If EPA would like additional information concerning the system, a section 114 request under the Clean Air Act would be an appropriate approach.

Response: The promulgated standard has been revised to require a "description" rather than a "detailed description." EPA agrees that a detailed description is not necessary in the initial report. Additional information can be gathered as necessary under section 114 of the Act or through inspection. If EPA does request information of a proprietary nature, the Clean Air Act does provide for an owner or operator to request confidential treatment of that information.

8. VC-27

Comment: Section 61.67(g)(1)(i) should be amended to take cognizance that it is impossible to sample the exit of a flare. Sampling of a flare should not be required if it can be demonstrated that such a control flare is actually operating.

Response: EPA is aware that the exit of a flare cannot be tested with Method 106. EPA, however, has no data which indicates that a flare is as effective as an incinerator in controlling vinyl chloride emissions or that a flare can meet the 10 ppm requirement. Therefore, a blanket exemption for testing cannot be granted. If an owner or operator could provide data to EPA that showed that a flare could meet the standard, a waiver of source testing could be granted on an individual basis.

9. VC-17, VC-29

Comment: In the regulation, the only mention of the option of using a portable hydrocarbon detector for measuring reactor opening emissions is §61.67(g)(5)(i)(B). Section 61.67(g)(1) should also state that the portable hydrocarbon detector can be used for the testing required in §61.64(a)(2).

Response: Section 61.67(g)(1) outlines the testing procedures to be used for stack emissions. The test methods to be used for reactor opening emissions are outlined in §61.67(g)(1)(i)(B). Test Method 106 only is to be used for stack emissions.

2.5.2 §61.68 as proposed or §61.69 as promulgated

1. Comment: The Agency must realize the tremendous task it has set for both itself and industry in attempting to take all the readings for determining compliance on all source points, preparing the necessary reports, requests for variances, compliance programs, and approved procedures, forwarding these to the Administrator, receiving his reply, and acting on the reply all within 90 days of promulgation. Total confusion will result from even the slightest lack of coordination in all of these frantic activities at 50 or so plants, and in the Administrator's office. It may be wise to omit this original report, or delay it for 90 to 180 days.

Response: Section 112 of the Clean Air Act requires that a plant be in compliance with the standard within 90 days of promulgation, unless a waiver of compliance is obtained. This is the basis for requiring that emission tests be conducted within 90 days. Several commentators have indicated that they will request a waiver of compliance. If these results for waivers are granted, the number of emission tests will be reduced. The regional offices rather than the Administrator's office will be handling these various reports.

2.5.3 §61.69 as proposed or §61.70 as promulgated

1. VC-13, VC-21, VC-27, VC-29

Comment: Section §61.69(b)(1) requires a report 180 days after the effective date, while §61.68 requires a very comprehensive initial report 90 days after the effective date. The magnitude of these two reports is such that the allowable time is insufficient, and it is unlikely that all the facilities and procedural approvals required for the semi-annual report will be available immediately after the effective date. It is requested, that §61.69(b)(1) be amended so that the first semi-annual report is due 270 days after the effective date or 180 days after the initial report, whichever comes first.

Response: The standard has been revised so that the first semi-annual report will not be due for at least 180 days after the initial report. All semi-annual reports will be due on March 15 and October 15. The first semi-annual report will be due after the first full semi-annual report period has past since the initial report was received. As an example, if the initial report is received by EPA on September 15,the first semi-annual report will be due the following March 15.

2. VC-29

Comment: To clarify the intent of the standard, §61.69(c)(2) should be changed by substituting the words:

"(2) The owner or operator shall include a summary of the analytical results on the stripped resin. Test Method 107 or equivalent is to be used."

Response: Clarifying changes have been made to this paragraph.

3. VC-23

Comment: The monitoring and record-keeping requirements in the proposed rules appear to be adequate.

Response: No response necessary.

4. VC-13, VC-22, VC-29

Comment: The standard requires that the vinyl chloride levels in stripped resin be measured for each batch. It also requires that the vinyl chloride in reactors be measured each time they are to be opened. The preamble to the proposed standard suggested that for both reactor opening and improved stripping, it is possible over time to establish a relationship between the emissions measured and certain operating parameters. The general provisions and the proposed standard provide for waiver of emission tests and use of alternative or equivalent methods. The preamble stated further that under the authority of these provisions, EPA could, on an individual basis, permit a plant to record certain operating parameters rather than measure emissions. The alternative of recording operating parameters should be included in the standard rather than mentioned in the preamble.

Response: EPA is preparing an enforcement guidelines document. It will recommend that the appropriate enforcement officials accept recording of operating parameters as an alternative test method after a plant has clearly demonstrated a relationship between measured vinyl chloride levels and certain operating procedures. Recording of operating parameters is not included in the standard as an alternative test method procedure because of the individual differences among plants and resins. For improved stripping for example, specific operating conditions have to be established for stripping each different kind of resin at each different kind of plant. Establishment of the operating conditions to be used for each resin at each plant are best handled on an individual basis.

2.6 Test Methods

1. VC-13

Comment: Method 106 was designed for isokinetic sampling of dusts and mists, not for sampling of gases. Appropriate changes are in order.

Response: Apparently, the commentator failed to read Method 106, as it has nothing to do with isokinetic sampling.

2. VC-14, VC-44

Comment: Test Method 106 is a very detailed testing procedure, capable of determining mass emission rates from equipment. The use of this elaborate procedure where only a concentration determination is required is burdensome and unnecessary.

A properly calibrated detector for vinyl chloride can make this determination with greater ease and equal precision for purposes of this section. We request that this section be modified to allow emission concentration limits to be measured with a calibrated vinyl chloride detector where emission limits are prescribed in section 61.62(a), 61.63(a) and from the control system.

Response: Method 106 yields an emission concentration only, not a mass emission rate.

Specification of Method 106 implies that an averaged emission concentration determination is required for a minimum period of one hour for each of three runs. Since it would be difficult to specify the correct number of instantaneous readings necessary to replace a single averaged value for each of the great variety of sources covered by the vinyl chloride standards, the integrated sample approach must remain the reference method. However, it is envisioned that individual sources may wish to develop data to substantiate the equivalency of instantaneous sample data for their processes. This data would consist of enough duplicate instantaneous/integrated sample data to be able to statistically determine how many instantaneous data points spread over a minimum period of one hour would be required for the average to not be statistically different from the integrated average values at the 95 percent confidence level. The conditions set forth in §61.67(g) would still apply with regard to any subsequent dispute over equivalency.

3. VC-17, VC-26, VC-29

Comment: Tedlar bags are expensive ($91 each). We recommend Saran bags ($6 each) as alternates.

Response: While EPA has no direct experience with Saran bags for vinyl chloride testing, data have been published which indicate a bag of this material could have a significant loss of vinyl chloride. The only bag material which is acceptable in place of Tedlar is aluminized Mylar.

4. VC-17, VC-29

Comment: Section 4.3.1 of Test Method 106 specifies a strip chart recorder for the gas chromatograph, while section 6.4 calls for measurement of peak area with an automatic integrator. We believe that the strip chart recorder is adequate for this use and that the automatic integrator is unnecessarily elaborate and expensive ($5200) when peak height, triangulation and disc integrators are sufficiently accurate for this use.

Response: "... automatic integrator" has been changed to "disc integrator." For a laboratory that processes a larger number of samples, an automatic integrator may be a worthwhile investment, and would of course be acceptable.

5. VC-17, VC-27, VC-29

Comment: Most gas chromatographs are designed to use hydrogen and air for their flame detectors. When so used, they are capable of detecting 0.5 ppm vinyl chloride in air. This seems to be sensitive enough to monitor the 10 ppm limit that the standard calls for. The replacement of air by oxygen in the combustion gas therefore seems unnecessary.

Response: "Oxygen" will be changed to "air or oxygen, as required by the detector."

6. VC-17, VC-29

Comment: The integrator recorder specified in section 5.3.6 of Test Method 107 seems unnecessarily elaborate as the measuring device. Here, especially, the vinyl chloride peak is so sharp that any measurement other than peak height would be difficult. A strip chart recorder with a sensitivity of 1 millivolt full scale is adequate for this use.

Response: If sample injection time is varied for some purpose, peak broadening may occur. Accordingly, it is preferable to measure peak area. For the number of samples that most facilities will be analyzing, the integrator recorder specified in 5.3.6 would seem to be a wise choice. However, manual techniques may prove to be acceptable.

7. VC-17, VC-29

Comment: Regarding 5.3.2, in Test Method 107, Supelco, Inc., Supelco Park, Ballefonte, Pennsylvania 16823, recently announced that they are discontinuing Carbopack A. However, they say that 0.2 percent Carbowax 1500 on Carbopack C gives the same separation of vinyl chloride as 0.4 percent Carboway 1500 on Carbopack A.

Response: Carbopack C will also be listed in 5.3.2.

8. VC-17

Comment: Regarding 7.2.1 and 8.1 of Test Method 107, we cannot see why water is added to dry resin samples and to the calibration vials. It seems more logical to run the calibration standards and dry resin samples without water and to use Equation 107-4 when water is present in samples.

Response: If any water is present in the sample, the water elutes from the gas chromatograph column in a broad band, encompassing the time the vinyl chloride is eluted. As the water affects the sensitivity of the flame ionization detector, it was thought best to add enough water to every "dry" sample to have a water vapor saturated gas sample for the gas chromatograph thus insuring a reproducible amount of water vapor in each sample.

9. VC-17

Comments: The constants in Equations 107-3 and 107-5 of Test Method 107 could not be generated from Equation 107-2 and 107-4, respectively.

Response: A value for V_g of 23.5 was used instead of $23.5 - \frac{M_t}{1.4}$ as published.

The equations were correct as published, except brackets were missing in Equation 107-5 (See comment number 21 in this section).

10. VC-18, VC-27

Comment: Concerning §61.61(n), the definition of portable hydrocarbon detector, the two recommendations are to relax the sensitivity requirement from the proposed 5 ppm to 10 and 20 ppm, respectively.

Response: The definition of portable hydrocarbon detector has been revised to relax the sensitivity requirement to 10 ppm. Based on information supplied by Commentator VC-27, analyzers with a sensitivity of 5 ppm "are extremely delicate and require a high level of maintenance and considerable redundancy of units would be required." The standard requires that a portable hydrocarbon detector be used to detect leaks and measure vinyl chloride concentrations in equipment before opening it. In both cases an instrument with a sensitivity of 10 ppm will be adequate.

11. VC-26

Comment: In the drawing on page 59550 (Figure 106-1) valves should be provided for the sample bag; otherwise the method cannot be used.

Response: The ball check in the single bag female quick connect seals the bag when the sample line male quick connect is removed.

12. VC-27

Comment: The suggested technique in Test Method 106 is to sample into a Tedlar bag at ambient conditions and analyze the bag contents. Any stream which contains large amounts of water, or saturation ethylene dichloride at process temperature, will cause erroneous numbers for vinyl chloride due to condensation. This would result in serious errors in steam vent analysis. Assuming 1 percent inerts, one can postulate a 100-fold concentration of vinyl chloride into the vapor cap. For saturated ethylene dichloride streams at 100°F, taken to a laboratory at 70°F, the condensation results in a 10 percent decrease in the volume; however, in a 100-liter sample about 40 cc of liquid EDC would be present. This will dissolve vinyl chloride from the vapor cap, and thus one would not measure the true vinyl chloride concentration.

A suggested better sampling technique would be to cool the sample to -4°F and analyze the liquid contents. The total sample would then be a combination of the liquid condensed and gas volume which can be accurately measured in the laboratory.

Response: No steam vent analyses are contemplated.

EPA investigated the possibility of water condensation causing errors in the bag sample vinyl chloride concentration, due to condensation of vinyl chloride with negative results. Since all bag samples would be analyzed at room temperature, it is expected that the vinyl chloride concentrations would be automatically normalized to the corresponding water vapor saturation concentration. The bag concentration of vinyl chloride is finally reported on a dry basis, corrected for that water vapor concentration.

The importance of the reported effect of condensed ethylene dichloride on the vinyl chloride concentration is still being investigated, but no actual case where the suggested situation exists has been found. However, if such a case does occur, the suggested technique should prove to be acceptable.

13. VC-27

Comment: The use of a reverse "S" type pitot tube for flow measurement as described in Test Method 106 is adequate for highflow rates like those in the vent scrubber stack; however, for tank vents, vents on vessels, and other low flows (less than 10 fpm) the "S" type pitot tube does not give adequate flow measurements.

Response: Currently there are no low flow (less than 10 fpm) streams which are required to be tested. If this problem should arise in the future, it can be resolved at that time.

14. VC-27

Comment: The isothermal method of operation in Test Method 106 is fine for "air samples" but in analyzing vent streams up to 2 hours would be required for one analytical run. Analyzing each sample to ± 5 percent might require 6-8 hours of analysis to get a repeat on one sample. For several samples taken the same day there would be an inordinate amount of time for analysis. We would suggest duplicate runs in a temperature-programmed mode of operation.

Response: With proper care, temperature programming of the gas chromatograph operation should facilitate analysis, and is not meant to be precluded by absence of a description in the test method.

15. VC-27

Comment: The daily calibration curves required by Test Method 106 are unnecessary. A calibration curve run once for linearity and one standard daily check should maintain quality control on the instrument. Our experience has shown that vinyl chloride factors on a flame detector are valid for several months.

Response: If Method 106 tests are run on a routine basis, experience may show that daily calibration is unnecessary; however, for limited applications, the daily calibration would be advised.

16. VC-27

Comment: The leak-proof rigid containers described in 4.1.5 of Test Method 106 are the size of a 40 gallon drum and would be extremely difficult and hazardous to move to the top of a vent scrubber, out of a tank farm, etc., and would pose serious operator problems for sample-point logistics. Alternative considerations should be reviewed.

Response: Since Method 106 is only rarely used, the on-site disadvantages of the bag container should not constitute a major problem. For discussion of replacement of the integrated sample procedure, see comment VC-14.

17. VC-27

Comment: Only one specific column material is allowed in 4.3.2 of Test Method 106. This should be revised to permit use of any column which results in adequate resolution and determination of the vinyl chloride peak.

Response: Chromosorb 102 is the only column which EPA has investigated to determine possible interferences, etc., for the analysis of vinyl chloride. It is expected that other columns may work equally well, but substantiating data must be provided to EPA before equivalency can be determined. The method has been revised to include a secondary column, which is necessary to resolve acetaldehyde, if present, in the sample, from vinyl chloride.

18. VC-29

Comment: Why is it not possible to use a portable hydrocarbon analyzer in place of Method 106 in all cases where Method 106 is specified?

Response: Specification of Method 106 implies that a specific determination of only vinyl chloride (i.e., not to include any other substance) be made. Method 106 is a reference method, by which the appropriateness of other methods for specific applications can be judged.

19. VC-29

Comment: "The use of a heated sample loop and automatic sample valve (Section 4.3.1) is not necessary since the bag sample is not heated. A gas tight syringe is adequate for transferring the sample from the bag to the gas chromatograph."

Response: Because of the relatively small surface area/volume ratio of the heated sample loop and automatic sample valve, heating produces favorable results insofar as peak resolution and sharpness are concerned. Use of an automatic sample valve, as opposed to a syringe, greatly improves the repeatability of analysis.

20. VC-29

Comment: Equilibrium data for the vinyl chloride-water system are available which conflict with the EPA K-value of 5.0×10^{-6} (p. 59552, Column 2). Air Products reports a value of 1.3×10^{-6} which is more consistent with a value of 0.9×10^{-6} determined by Ethyl Corporation .... the constant in equation 107-5 (2.066×10^{-3}) depends on the K-value for water and should be corrected accordingly.

Response: The K value for a 1 cc water sample of 5.0×10^{-6} was derived through careful study by B. F. Goodrich. The other K values apparently are for larger water volumes.

21. VC-29

Comment: Brackets have been omitted from equation 107-5.

Response: Brackets have been added.

22. VC-2

Comment: The last paragraph under 9.2 of Test Method 107 is not applicable to equation 107-5. Equation 107-5 applies only to water samples, where TS = 0. Reference to 107-5 should be deleted and the paragraph relocated after equation 107-4.

Response: This comment is correct; the changes noted have been made.

23. VC-35

Comment: Detailed performance specifications should be given for the vinyl chloride detector, and should be similar to those given where monitoring is required in Part 60 (Standards of Performance for New Sources).

Response: The promulgated standard requires that the monitoring system consist of a gas chromatograph; or if it is assumed that all hydrocarbons measured are vinyl chloride, infrared spectrophotometry, flame ion detection, or an equivalent method may be used. The standard included this flexibility so that if a plant has purchased a monitoring system for purposes related to the OSHA standards, it would not have to purchase a new system to meet the EPA standard. A gas chromatograph is 100 percent accurate if calibrated properly. EPA has developed some criteria for judging the adequacy of a plant's calibration and maintenance schedule for the monitoring system. These will be included in an enforcement guidelines document.

24. VC-35

Comment: The sampling procedure in paragraph 6.1 of Test Method 106 is not clear. The description of the sampling procedure in paragraph 6.1 and the drawing in Figure 106-1 do not include correct instructions for purging the sample line prior to sampling. If the instructions are followed as proposed, erroneous results will be obtained because the purged air will be drawn into the sample bag. Paragraphs 4.1.3 and 6.1 and Figure 106-1 should be changed.

Response: The procedure is correct as written. While the sample line is purged into the bag, the bag is subsequently evacuated before sampling commences.

25. VC-35

Comments: Four typographical errors are noted.

Response: These corrections have been made.

26. VC-42

Comment: A specialized procedure is described in §61.67(g)(1)(i) for use in sampling the emissions due to purging of vinyl chloride from reactors after a batch is completed.

Response: EPA calls this reactor opening emissions and has specified a method separate from the stack test method for testing these emissions. See §61.67(g)(5).

27. VC-42

Comment: In §61.67(d) the average of three runs may not be adequate to represent the emissions. It is recommended that EPA require the source operator to supply technical evidence that the average of the three runs adequately represents the total emission rate for each source tested.

Response: Most of the regulations in Parts 60 and 61 require that three runs be conducted for each test. There is no apparent reason for making the testing for vinyl chloride different. It is unclear how a source operator would "supply technical evidence that the average of the three runs adequately represents the total emission rate for each source tested" without doing additional tests. EPA believes that a definitive endpoint on the number of runs conducted is necessary.

28. VC-42

Comment: With regard to Test Method 106 we recommend the use of aluminized teflon tubing and tedlar bags to minimize the absorption and desorption of vinyl chloride by the plastics (see Analytical Chemistry, 12, 1075A, 1975).

Response: Tedlar bags are specified. Aluminized Mylar bags can also be used, provided that the samples are analyzed within 24 hours of collection. Use of Teflon tubing is monitored through labeling and replacement for each new set of samples.

29. VC-44

Comment: Commentator VC-44 fails to see the need for taking a vinyl chloride sample at a rate which is proportional to the gas stream flow rate. The concentration variation is not necessarily proportional to mass flow and the sampling can be stopped between batches, if necessary.

Response: Use of Method 106 implies that a time averaged sample is required. The only instance where a proportional sample would not be required would be where the stack concentration was proportional to the stack flow rate.

If the sampling is not done proportionally, then the burden of proof that proportional sampling was not necessary will lie with those doing the testing.

30. VC-50

Comment: Commentator VC-50 has found that on a Chromosorb 102 column using helium carrier gas, acetaldehyde has the same retention time as vinyl chloride and vinyl chloride cannot be distinguished from acetaldehyde unless the effluent from the column is fed into a mass spectrometer. It is therefore recommended that unless acetaldehyde is positively known to be absent from the stack gas, a different column be used.

Response: Section 3, "Interferences," of Test Method 106 will be reworded to include specific precautions regarding acetaldehyde interference.

2.7 Economic Impacts

1. VC-17

Comment: Imposed substitution of other materials for polyvinyl chloride products may have adverse economic effects.

Response: Substitutes for polyvinyl chloride are not being imposed upon the industry. Polyvinyl chloride products will still be free to compete in the marketplace with substitute products on the basis of price and performance characteristics. It is believed that the price increase in polyvinyl chloride resins resulting from the standard will not cause appreciable substitution of other products.

2. VC-22

Comment: The decrease in demand for polyvinyl chloride during 1973-74 stated as 2.4 percent should be 0.4 percent and referred to as a decrease in consumption, not demand.

Response: The figure for decrease in consumption of 2.4 percent was based upon an estimate of 1974 sales. Final 1974 figures now available indicate that the actual decrease was 0.5 percent. It is agreed that "consumption" is a better term than "demand".

3. VC-26

Comment: EPA's estimated installed capital cost of $524,000 for the oxychlorination process incineration is too low. The commentator estimates the cost to be $2,200,000.

Response: EPA did not estimate the cost of the oxychlorination incinerator to be $524,000 but rather 524,000 times the volume of the stream to be incinerated raised to the 0.53 power. At the model plant volume of approximately 6100 SCFM this results in a capital estimate of $1,369,000 (Table 7-7, page 7-78). The basic algorithm that was used for cost estimating purposes was based upon information submitted by five vinyl chloride producing firms and one EPA contractor. The commentator's estimate was one of the estimates used by EPA to develop the basic algorithm.

4. VC-26

Comment: The description "Allied Chemical/Geismar" used in Tables 7-24 through 7-32 should be changed to "Allied Chemical/ Baton Rouge". The production capacity attributed to Allied Chemical in the STAR document is incorrect.

Response: No response necessary. This comment serves as a correction.

5. VC-26

Comment: EPA estimates for control costs at the Allied Chemical/ Baton Rouge facility are lower than current company estimates.

Response: The total cost for the Baton Rouge plant is obtained by adding the costs incurred at the ethylene dichloride plant (Table 7-17) with the costs incurred at the vinyl chloride plant (Table 7-24). If this is done the total air pollution control costs are estimated to amount to $889,000 and total water pollution control costs are estimated at $1,775,000 for a grand total of $2,664,000 versus the company estimate of $2,260,000.

6. VC-27

Comment: The view that large, integrated petrochemical and chemical companies would supposedly have access to sufficient capital to invest in control devices is inappropriate without consideration of other company projects competing for capital.

Response: Consideration of the capital demands for competing products has been recognized. The background document states: " ... firms that own the various ethylene dichloride plants are generally large, integrated petrochemical and chemical companies that would supposedly have access to sufficient capital to invest in the additional control equipment. Whether a firm would actually choose to invest those funds in control devices, however, cannot be predicted with any degree of certainty particularly for those firms that are experiencing post-control decreases in profitability compared to the pre-control case." (Page 7-27) The intent of this statement was to point out that even though firms would probably have access to sufficient capital to invest in control devices they still might not choose to do so for profitability reasons.

7. VC-27, VC-29

Comment: Rates of return, profitability, and pricing parameters are predicted on 100 percent operating rates rather than a more realistic 85 percent rate. The economic impact would be dramatically altered if 85 percent was used.

Response: An operating rate of 100 percent was arbitrarily selected due to the difficulty in estimating expected operating rates. The use of this rate, however, does not alter the economic impact of the standard. The percent price increase that would be required in order to recover control costs and maintain pre-control profitability would be essentially the same whether 100 percent or 85 percent was used as the basic operating rate.

8. VC-27

Comment: Incineration costs for the model ethylene dichloride-vinyl chloride facility are understated.

Response: EPA does not believe that costs for the model ethylene dichloride-vinyl chloride plant are understated. EPA is aware of the incinerator costs claimed for the commentator's plant and believes that these costs include items that would not be found in a typical facility.

9. VC-29

Comment: Production decreases in 1975 caused depression in prices and profits which reduced the capability of the industry to obtain capital or raise prices.

Response: Whereas conditions in the polyvinyl chloride industry were depressed in 1975, a return to more normal conditions is expected for the industry. Since it is not possible to develop a year-by-year impact analysis based upon projected industry performance it must be assumed that normal conditions will prevail in the long run.

10. VC-29

Comment: No adjustments for inflation to 1976 and 1977 conditions were made in the cost estimates.

Response: All financial information, control costs included, was adjusted to reflect conditions as of a certain date. The assumption has been made that product prices will generally rise along with increases in costs so that profitability will be unaltered over time. Given this assumption it is unnecessary to adjust costs and revenues for inflation since their increases essentially cancel each other out.

11. VC-29

Comment: The estimate of capital requirements for a carbon adsorption system in the model suspension process polyvinyl chloride plant is understated.

Response: The polyvinyl chloride model plant carbon adsorption costs were based on data obtained from four sources of information: three polyvinyl chloride companies and one EPA contractor. The installed costs, when scaled to the model plant volumetric flowrate, ranged from $140,000 to $545,000. The $333,000 figure was the average of these four estimates. As this example illustrates, the EPA model plant control costs were based on data from diverse sources. They do not necessarily reflect the situation at any particular polyvinyl chloride plant, where the costs may be higher or lower for one or more reasons.

12. VC-29

Comment: The capital and operating costs for incineration are understated by a factor of two for polyvinyl chloride plants and a factor of two to three for ethylene dichloride-vinyl chloride plants.

Response: The costs for incineration at polyvinyl chloride and ethylene dichloride-vinyl chloride plants have been based on a range of data. Six information sources were employed: five companies and one EPA contractor. The installed cost listed industry sources in Table 7-7 resulted from a least-squares analysis of the cost data from these six sources and is intended to represent average conditions. It is expected that some facilities would experience lower costs and some would experience higher costs.

13. VC-29

Comment: The allowance for administrative, selling, research and development, and interest costs is understated and overstates the return on investment at a given plant.

Response: Estimated costs for these items were derived after consultation with a committee composed of industry representatives. EPA sees no valid basis for altering any of the figures that were used.

14. VC-29, VC-32

Comment: Costs are grossly disproportionate to benefits for water stripping, evacuation of compressors, double mechanical seals on pumps, leak detection, and removing vinyl chloride from reactors before opening:

Response: The standard for vinyl chloride is based on best available control technology. The term "grossly disproportionate" was introduced into the supporting documents for the standard because the term "best available control technology" could be interpreted in different ways and EPA thought it was desirable to place some limitations on it. The first limitation was that the control technology must be in use in one or more plants in the chemical industry and be generally adaptable for use at the plants subject to the standard within the time allowed for compliance under section 112. Second, costs were considered only when they were grossly disproportionate to the emission reduction achieved. Technologies which EPA considered to not fit into its definition of best available control technology included placing a bubble around a plant to capture all the emissions from it for control, using multiple incinerators on a gas stream, and incineration of the emissions from the oxychlorination process. The reason for not requiring incineration of the emissions from the oxychlorination process are the relatively low emissions from it compared with the very large expenditure of energy which would be required to incinerate.

Obviously, there is some judgment involved in interpreting which costs are "grossly disproportionate." In EPA's judgment the cost of controls mentioned by the commentator are not in the same category with the oxychlorination process. Although the commentator may view these controls as not being cost-effective, in EPA's judgment the costs are not grossly disproportionate.

Although the economic impact study included in the SSEIS, Vol. I addressed cost-effectiveness, its primary purpose was to inform EPA whether the standard was affordable and, if so, what the impact would be. The standard was not based on costs. The cost data was developed to determine the impact of the standard. Even under section 111 of the Act, where standards are to be based on "best demonstrated control technology (considering costs)"; the standards are based on whether the standard is affordable rather than cost-effectiveness. It is not reasonable to consider costs to a greater extent for standards promulgated under section 112 than for those promulgated under section 111.

As mentioned before, EPA did look at cost-effectiveness. The cost-effectiveness ratio for the oxychlorination process is 3.65. In comparison, the cost-effectiveness ratio for fugitive emissions in ethylene dichloride-vinyl chloride plants is .48. In polyvinyl chloride plants the cost-effectiveness ratio for fugitive emissions is .14, for relief discharges and reactor opening is .31 and for water stripping is .80. Evacuation of compressors, double mechanical seals or pumps, and leak detection are included in the cost-effectiveness ratios for fugitive emissions.

15. VC-29

Comment: On Table 7-40, Tenneco/Flemington, Tenneco/Pasadena, and Union Carbide plants were omitted.

Response: The comment is correct.

16. VC-29

Comment: On Table 7-15, the total annualized cost should be $773,000 instead of $793,000.

Response: The correct number is $793,000. However, the figure of $407,000 shown on Table 7-15 should be $427,000.

17. VC-32

Comment: The number of plant shutdowns has not been accurately estimated.

Response: The number of plant shutdowns was inaccurately estimated, in that three out of four plants EPA forecasted would close have since told EPA they will not close. The fourth plant no longer produces polyvinyl chloride. Plant closures attributable to other regulations, if any, are not considered since they are not believed to be a direct consequence of the proposed EPA regulation. It would appear that the immediate cause of the closing of the Uniroyal plant is the OSHA regulation, although anticipation of the EPA regulation may have influenced the decision.

18. VC-32

Comment: The economic analysis is simplistic.

Response: The major thrust of the economic analysis is to determine the impact upon industry growth, prices, and plant closures. It is believed that these issues are treated in a full and complete manner.

19. VC-34

Comment: EPA cost estimates are low.

Response: EPA cost estimates were based upon estimates provided by control equipment vendors and by polyvinyl chloride industry representatives. As might be expected, estimates of control costs varied. EPA believes that its estimates reflect average costs that might be incurred at a typical facility. It is expected that individual plants will have control costs that vary from the EPA estimate on both sides.

20. VC-34

Comment: Polyvinyl chloride plant profitability in Table 7-5 is overstated.

Response: The prices shown in Table 7-5 were published prices. Prices used in succeeding profitability calculations were based upon consultation with industry representatives.

21. VC-34

Comment: Annualized capital charges do not include any profitability factors.

Response: Annualized capital charges, by definition, exclude profitability factors. An analysis of profitability impacts is carried out in the economic analysis.

22. VC-34

Comment: The bases for the direct operating costs for control alternatives is questionable.

Response: The various items included in the direct operating costs were discussed in Chapter 7, on page 7-9.

The unit prices used on computing these various items are as follows:

Fuel:	$2.00/million BTU
Electric Power:	$0.03/kw-hr
Steam:	$3.00/thousand pounds
Inert Gas:	$.21/100 SCF
Labor:	$6/man-hr.
Cooling Water:	$.10/thousand gallons
Process Water:	$.25/thousand gallons
Caustic Soda:	$0.35/lb

23. VC-34

Comment: The process scope for estimating investment costs for control alternatives is questionable.

Examples are: (1) rubber-lined carbon-steel slurry tanks to replace stainless-steel vessels, (2) reactor opening control does not include tanks, pumps, and distribution lines for water purge or headers for relief valve vents, and (3) no scope description for improved stripping.

Response: The process scope for estimating investment costs is as follows:

1. Slurry Blend Tanks

As is stated on page 7-14 of the Standard Support and Environmental Impact Statement, the existing slurry blend tanks in the model plant are insufficient to withstand the pressure associated with venting to an incinerator. Therefore, they would probably need to be replaced.

The costs in the document were based on the following assumptions:

Each blend tank had a capacity of 24,000 gallons (3,342 ft^3).
Two tanks were installed in each reactor line.
The cost of removing an existing tank was offset by its salvage value.
The tank diameter equalled the height (16.2 feet).
The tank design pressure rating was 50 PSI gauge.
Tanks were fabricated of a carbon steel, lined with 1/4 inch rubber.
Costs were obtained from Guthrie's "Process Plant Estimating Evaluation and Control," 1974 edition, p. 151.

2. Reactor Opening Controls

As tables 7-8 and 7-9 indicate, costs for reactor purge water systems have been developed for controlling the relief valve discharge and reactor opening emission points. Each of these systems includes a storage tank for the purge water, a header system and pumps to deliver the water to the reactors.

The capital costs were obtained from two sources, both of which were polyvinyl chloride plants using these systems at the time. The costs - $102,000 and $310,000 were averaged to obtain the $206,000 figure for the model suspension plant. The dispersion plant cost ($78,000) was calculated by scaling from the suspension plant reactor capacity (90,000 gallons) to the dispersion plant capacity (18,000 gallons), using a 0.6 factor.

Although the costs of a header system for relief valve vents was not included under reactor opening controls, it was accounted for under fugitive controls (see tables 7-11 through 7-14). The cost of this collection header system varied substantially according to each plants' process configuration. Based on data from four polyvinyl chloride plants, the installed system cost ranged from $15,000 to $229,000. (Process capacity had no recognizable effect on the costs). The average of these numbers ($84,200) was used for all form model plant costs.

3. Improved Stripping

The costs for improved stripping varied considerably among the sources from which data were obtained. For stripping in suspension plants, data were submitted on four plants, ranging in capacity from 70 to 250 million pounds/year. The installed costs ran from $195,000 to $2,085,000.

These costs were plotted against capacity on logarithmic paper and the function listed in Table 7-6 resulted.

The same approach was used for dispersion improved stripping. Here data from four plants (ranging from 16 to 60 million pounds/year in capacity) were used.

For bulk plant stripping, cost data from one plant (with a capacity of 160 million pounds/year) were scaled to the model plant capacity, 100 million pounds/year, using a scaling factor of 0.53 (This factor was taken from the suspension and dispersion plant cost functions).

The various improved stripping systems used in deriving the cost functions differed in scope, simply because the plants in which they were installed had diverse process configurations. However, a typical system included: stainless steel stripping vessels with agitators, condensers, and vacuum pumps, plus all the required instrumentation, piping, etc.

The bases for direct operating costs were as follows:

Where itemizations were available, the following unit values were used to complete direct operating costs:

Item	Unit Value
I. Operating Labor	$6/man-hr
II. Utilities:	
1. Electric Power	$0.03 kilowatt-hr
2. Fuel (Natural Gas)	$2.00/million BTU
3. Process Water	$0.25/thousand gallons
4. Cooling Water	$0.10/thousand gallons
5. Steam	$3.00/thousand pounds
III. Operating Materials	
1. Sodium hydroxide	$0.35/pound
2. Nitrogen	$0.21/hundred cubic feet
IV. Maintenance	
1. Incineration	5% of Installed Cost/Year
2. Improved Stripping	15% of Installed Cost/Year
3. Carbon Adsorption	3% of Installed Cost/Year
4. Water Stripping	5% of Installed Cost/Year
5. Automatic Short-Stopping	5% of Installed Cost/Year
6. Automatic Short-Stopping	10% of Installed Cost/Year
7. Reactor Purge Water System	6¢ of Installed Cost/Year

24. VC-40

Comment: The economic impact of the regulation has been underestimated.

Response: A detailed company-by-company study was beyond the scope of the analysis. EPA believes that the estimation of economic impact is satisfactory.

25. VC-47

Comment: The projected capital cost of meeting all the emission standards is $198 million. Of this total, $183 million falls on polyvinyl chloride plants and $15 million falls on ethylene dichloride-vinyl chloride plants. The annualized costs (including operating and maintenance) are expected to be about $70 million, of which $58 million would be borne initially by polyvinyl chloride plants and $12 million by ethylene dichloride-vinyl chloride plants. In addition, the fugitive emission standards would involve another $37 million of capital costs and $25 million annualized costs.

Response: The statement is incorrect. The cost of fugitive emission controls is included in the capital cost estimate of $198 million and the annualized cost estimate of $70 million.

26. VC-47

Comment: In reading through the proposed standard, there seems to be some question as to whether or not a spare reactor can be used as a gasholder or whether a separate gasholder is required. If, in fact, there is some ambiguity regarding this point, it would be worthwhile for the EPA to complete some further economic analysis before the issue is resolved. If a plant already had a spare reactor, the costs incurred to install a separate gasholder would have little benefit.

Response: EPA is concerned only that a vessel for holding vinyl chloride be provided. The vessel can be either a spare reactor or a separate gasholder. The economic analysis took a conservative approach and included the cost of a separately purchased gasholder.

27. VC-47

Comment: An economic analysis of the trade-offs between emission risks and prevention costs for control of relief valve discharges at ethylene dichloride-vinyl chloride plants should have been undertaken. These discharges occur infrequently at ethylene dichloride-vinyl chloride plants, as opposed to polyvinyl chloride plants. Based on information received by the Council on Wage and Price Stability, this requirement could involve costs as much as $2 million depending on the size of the plant and the distances involved.

If it is assumed that only one of the 17 ethylene dichloride-vinyl chloride plants will incur about $2 million to vent relief valves, $2 million in capital outlay could be saved in addition to any operating and maintenance costs that might be involved. Consequently, EPA's analysis should have considered this alternative.

Response: EPA agrees that relief valve discharges from ethylene dichloride-vinyl chloride plants occur relatively infrequently compared with polyvinyl chloride plants. The commentator did not provide EPA with the basis for the $2 million estimate; i.e., the control technology which would cost $2 million is not discussed. This makes it difficult to evaluate the comment. The reason for assuming that only one plant would incur the $2 million cost is not clear. In talking with industry representatives, it appears that the types of controls which would be installed to prevent discharged from these relief valves would consist of installing additional alarms to warn an operator of upset conditions, tying thermal relief valves into process lines, and avoiding operator negligence such as overfilling storage spheres.

28. VC-34, VC-47

Comment: The projected costs of the standards do not incorporate any estimates of the costs associated with the research and development of control technology, lost production from down-time during control equipment installation, and losses from startup. It seems that EPA should have incorporated some estimates of these costs if the full impacts of the standard are to be identified and analyzed.

Response: The comment is correct in that research and development of control technology would add some additional costs to meeting the standard. These costs would vary considerable from plant to plant and are difficult to estimate. Losses from down-time during control equipment installation and from startup would not appear to add significantly to costs because polyvinyl chloride production is a batch process and it is not unusual for ethylene dichloride and vinyl chloride plants to be shut down for maintenance.

29. VC-34

Comment: The economic analysis fails to consider duplicate control systems needed to operate at 100 percent service factor.

Response: Costs for duplicate control equipment were not included since the control systems were designed to operate continuously with only routine maintenance. It was assumed that the maintenance would be performed during normal plant maintenance shut-downs.

30. Proceedings from the Public Hearing, Presentation by Barry Castleman, p. 9.

Comment: Some polyvinyl chloride substitutes must be available for those uses listed by EPA as having no substitutes.

Response: EPA attempted to list those materials that the industry believes to be acceptable substitutes for polyvinyl chloride resins. It is agreed that some substitutes would probably exist for all polyvinyl chloride uses, but the question of acceptability in individual applications would have to be evaluated closely.

31. Proceedings from the Public Hearing, Presentation by Barry Castleman, p. 9.

Comment: The cost of vinyl chloride emissions in terms of worker health and community health and safety impacts has not been evaluated.

Response: It was beyond the scope of the analysis to attempt to quantify in economic terms the cost of vinyl chloride emissions to the general public.

2.8 Environmental Impacts

1. VC-21, VC-22, VC-29

Comment: "The discussion of potential adverse environmental impacts on page 1-24, 1-27, and 1-28 of the SSEIS, Vol. I regarding increased water consumption seems to be overstated. EPA expects increased water consumption from the use of such control systems as a reactor water purge system, improved stripping, waste water stripping, and carbon adsorption. We believe that there will be little, if any, increased water consumption and certainly nothing approaching the 6-38 percent range as noted on page 1-28 and as detailed in Table 6-13 on page 6-42.

"The reactor water purge control technique, according to Table 6-13, clearly results in the greatest water consumption. It should be noted, however, that only a small percentage of the polyvinyl chloride industry intends to utilize the reactor water purge control method. Also, there is no technical reason that water used for reactor purging cannot be used over and over again in a completely closed cycle. Obviously, water used in this type of system would have to be stripped of vinyl chloride content prior to discharge. Recycling of such water would minimize stripping requirements thereby conserving energy and would also minimize the use of our natural resource (water). We believe the numbers presented for reactor water purging are in error.

"The second noted source of increased water consumption as a result of applying the necessary controls is that noted for improved stripping. We question the quantities listed in Table 6-13. Steam requirements of 1,500-2,000 kg of steam per 10,000 kg of product are stated on page 6-5 for improved stripping. Using the highest amount stated (2,000) and calculating the steam requirements for a model 150 million pound per year plant as shown in Table 6-13, an increased water consumption of 3.6 million gallons/year is determined as compared to the quantity of 7 million gallons/year shown in Table 6-13. Similarly, other numbers presented in Table 6-13 for improved stripping are in error. As noted on pages 6-5, primary stripping, which is already used by most plants, required 2,000-4,000 kg of steam per 10,000 kg of product and improved stripping will require an additional 1,500-2,000 kg of steam per 10,000 kg of product. While these facts may be correct for some plants, they are not correct for the industry as a whole.

"Improved continuous stripping technology is not applicable to dispersion resins due to the extreme differences in stability of dispersion resins versus suspension resins. Batch stripping will continue to be employed for dispersion resins. Nevertheless, the steam quantities given on page 6-5 are greater than that required for stripping dispersion resins. Moreover, recipe water and steam stripping water do not discharge to a sewer, but rather are emitted to the atmosphere in the drying operation. Therefore, there is no increased waste water from improved dispersion resin stripping.

"For improved stripping of both suspension and dispersion resins, the quantity of steam sparged into the slurry which would result in increased water consumption is less than the 3,000-4,000 kg of steam per 10,000 kg of product stated on page 6-5. We conclude there will be no increased water consumption due to improved stripping, and no adverse environmental impact.

"The quantity of increased water consumption, as shown in Table 6-13, for water stripping is also questionable. The basis for such number is not given. It is technically possible to strip vinyl from these waste water sources by recycling such waste water sources to slurry stripping systems. By doing so, the amount of additional steam required is negligible.

"Increased water consumption data given for carbon adsorption is also questionable. First, this Table assumes carbon technology will be utilized across-the-board for the industry. Many producers certainly do not intend to use carbon adsorption. Additionally, even if carbon adsorption is used, regeneration with hot nitrogen is technically possible as noted on page 4-61. Obviously, if hot nitrogen is used, there would be no increased water consumption.

"Considering all other factors as noted above, it is questionable whether there would be any increased water consumption as a result of compliance with the proposed standard. Thus, it seems that EPA should make a more realistic analysis of the situation than it presently has done. Additionally, the percentage increase of water consumption as noted is meaningless in itself, particularly when based on the average of the range of numbers as shown in Footnote 1 of Table 6-13. The average of this range is extremely misleading and unrepresentative of industry operations for certain type of plants. When considering the range of base water consumption, the percentage increase is less than significant."

Response: Since there is no regulatory limit on the amount of water a plant can consume, EPA calculated the water consumption impact assuming that the control systems using water would be used and that there would be no recycling. It is gratifying to EPA to know that recycling will be used and that the water consumption impact will be negligible.

2. VC-29

Comment: The concern for hydrogen chloride emissions is overstated. Incineration will be used only to a small extent in vinyl chloride manufacture and to a lesser degree in the polyvinyl chloride industry because of economics.

Response: EPA is pleased if the hydrogen chloride impact is overstated. The SSEIS, Vol. I stated that incineration would be used only to a very limited extent in the polyvinyl chloride industry. The commentator did not name the types of control which would be used in the ethylene dichloride-vinyl chloride industry or explain the reasons for not using incineration to a large extent. The hydrogen chloride impact was calculated for an individual model plant. For those plants which do use incineration to control ethylene dichloride purification and vinyl chloride formation and purification, the commentator did not explain why the hydrogen chloride impact is overstated.

3. VC-29

Comment: The impact on solid waste stated for a carbon bed is conjectural. Not enough is known of bed life to permit an estimate, and the one to three years presented has no basis. It cannot be regenerated if contaminated by polymers, since polyvinyl chloride is less combustible than carbon.

Response: Page 1-29 of the SSEIS, Vol. I states that "since there has been very limited experience with carbon adsorption in the ethylene dichloride-vinyl chloride or polyvinyl chloride industries, it is not known for certain at this time what the carbon bed-life would be or whether the damaged carbon could be regenerated." The 1 to 3 year estimate was given to EPA by a vendor of carbon adsorbers based on experience with other substances, but is acknowledged to be conjectural. It is based on the only information available at the time.

4. VC-22

Comment: On page 6-5, it is stated that "the amount of vinyl chloride released into the inprocess wastewater is expected to be proportional to the amount of steam used, and thus would be increased by improved stripping." This statement is incorrect. In a stipping operation, the vinyl chloride removed from the resin is not transferred to the water but rather actually passes overhead as a gas with the steam. The steam is condensed and recycled back to the stripping operation.

Response: Since there is no requirement to reuse the steam, it was assumed that no recycling is involved. EPA is pleased that at least the company represented by the commentator recycles the steam.

5. VC-23, VC-35

Comment: EPA should require recycling of sludge from polyvinyl chloride plants if possible. The air emissions from sludge disposal sites have been subjected to preliminary investigation by EPA. Vinyl chloride levels at landfills were as high as 1.9 ppm, and in a residential area near one landfill the air contained 0.4 ppm. This exposure, because it is continuous, actually exceeds that permitted in the workplace (1 ppm, 8-hour exposure, 40 hours per week).

Response: The data referred to were obtained during a study done by Battelle for EPA which is entitled "A Preliminary Examination of Vinyl Chloride Emissions from Polymerization Sludges During Handling and Land Disposal" and is dated February 13, 1976. The results obtained were relatively high but it should be noted that they are instantaneous measurements. The 1.90 ppm figure cited by the commentator was measured only about 5 cm from the discharge stream during the discharge of fluid sludge to the landfill. The next highest measured value in the landfill area was 1.10 ppm. The study referred to was a preliminary study only. EPA's Office of Solid Waste Management Programs is planning to conduct a more detailed follow-up study to determine the extent of the problem. At the conclusion of that study it will be determined whether a regulation is needed, and if so, what type of control should be required.

There are two sources of the solid waste; (1) resin that cannot be marketed because it does not meet certain specifications, and (2) sludge removed from centrifuges and placed in ponds to separate out additional water. The vinyl chloride in sludge is primarily due to the vinyl chloride contained in polyvinyl chloride that collected in the centrifuge. Improved stripping required by the standard will reduce the vinyl chloride content of the polyvinyl chloride resin, and thus also of the sludge.

On a trip to a polyvinyl chloride plant, the plant personnel stated that much of the "off-spec" resin is sold or recycled by blending it in with other batches. The plant had just recently begun to also recycle the polyvinyl chloride sludge from the settling ponds. Another company has recycled sludge when the market demand for polyvinyl chloride has been high.

6. VC-23

Comment: The standard should be revised to require scrubber control of hydrogen chloride emitted from incinerators used to control vinyl chloride.

Response: In the preamble to the proposed standard, EPA indicated that it has plans to further evaluate the hydrogen chloride problem. Before establishing standards for a pollutant, EPA does a study which looks at the health effects and sources of the pollutant and determines whether standards should be set, and if so, under the authority of which section of the Clean Air Act. The National Academy of Sciences (NAS) has recently prepared for EPA a document which includes information on the health effects of hydrogen chloride. There are several sources of hydrogen chloride emissions. In fact, in ethylene dichloride-vinyl chloride plants, an incinerator used to control vinyl chloride is only one of the sources of hydrogen chloride. Since hydrogen chloride is a raw material in the manufacture of ethylene dichloride and a by-product in the manufacture of vinyl chloride, it is emitted from process equipment.

7. VC-46

Comment: Pages 6-33 of the SSEIS, Vol. I discusses allowable emissions in terms of pounds of kilograms of vinyl chloride per hour. No reference is made, however, to how the allowable emissions compare with the proposed standard.

Response: Pounds and kilograms are both a measure of mass. Pounds are in English units and kilograms are in metric units. In its documents EPA usually gives data in terms of metric units with the English units in parenthesis.

The standard, most of which is expressed in terms of concentration units, is related to the mass units in the following manner. EPA selected an average plant size. The production rate of the plant and the air flow rates from the equipment in the plant are known. With this information, it is possible to calculate the mass emission rates that would be emitted from this certain size facility when the standard is in effect.

8. VC-46

Comment: Pages 6-33 through 6-39 of the SSEIS, Vol. I compare the concentrations of hydrogen chloride in the vicinity of plants incinerating vinyl chloride with standards for hydrogen chloride in other countries. It is stated that EPA does not have a standard for exposure to hydrogen chloride and thereby lacks a yardstick for comparative measurement. Without further expansion, reference to ambient standards allowed in other countries should be omitted and justification should be presented for including a discussion over the ambient standards of 5 ppm which have already been established.

Response: In presenting information on environmental impacts, EPA believes that it is meaningless to report a long list of numbers without relating them to something. It would be helpful to compare them to an EPA standard. If one does not exist, it seems reasonable to compare them to standards established in other countries. These standards are based on health effects data. The 5 ppm standard referred to is for occupational exposure. All of the other standards discussed are below 5 ppm.

9. VC-46

Comment: Page 50 of the SSEIS, Vol. I discusses the caustic which would be required to neutralize the HCl collected in scrubbers. The fate and cost for disposal of the large amount of brine which would be released after neutralizing the HCl should be discussed.

Response: Neutralization of the HCl would result in sodium chloride being released into wastewaters. Since EPA has not deemed it necessary to require control of dissolved solids, there would be no additional cost associated with disposal of the sodium chloride. As discussed in the SSEIS, Vol. I, the amount of HCl that would have to be neutralized would be considerably reduced by reclaiming the HCl. HCl is a raw material used at ethylene dichloride-vinyl chloride plants.

10. VC-46

Comment: On page 6-59 of the SSEIS, Vol. I reference is made that plants could possibly reduce energy impact because they are typically located in large petrochemical complexes. The rationale for this statement should be clearly stated. Proximity to large petrochemical complexes will afford availability, but will not reduce the energy required.

Response: Incineration of hydrocarbons produces heat. The heat can be used in other processes in the plant. This provides an energy savings because otherwise the heat would have to be generated.

1. VC-46

Comment: On page 6-59 of the SSEIS, Vol. I, the statement is made that energy consumption at polyvinyl chloride dispersion plants to attain the Alternate II control level would be increased by a factor of ten over the energy consumption of plants attaining the Alternate I control level. Considering that this alternate would accomplish only a four percent reduction in emissions of vinyl chloride, some reference should be made to show how much vinyl chloride reduction would be equivalent to a ten-fold increase in energy to accomplish this decrease.

Response: The four percent difference in the emission reductions between Alternative I and II is for ethylene dichloride/vinyl chloride plants. For polyvinyl chloride dispersion plants Alternative I reduces emissions by 52 percent and Alternative II reduces emissions by 95 percent. (See Table 6-2 on page 6-9).

2.9 Process and Control Technology (Chapters 3 and 4 of Volume I of the Standard Support and Environmental Impact Statement).

1. VC-26

Comment: Furnace tubes, in the vinyl chloride conversion from ethylene dichloride, are not packed with charcoal or pumice as reported in the SSEIS, but are empty.

Response: EPA's statement was based on a draft document which is reference 6 in chapter 3. EPA now concurs.

2. VC-22

Comment: Vinyl chloride is a liquid below 7°F. It could not "float" on a pond of water as written on page 4-52 of the SSEIS.

Response: EPA concurs. The point was that the residual vinyl chloride monomer will be evaporated from the ponds, not staying in the water.

3. VC-22

Comment: Not all pressure rises can be detected by instrumentation in time to avert over-pressure conditions as stated on page 4-30 of the SSEIS.

Response: Change to "In most cases, potential problems can be quickly detected by instrumenting each reactor with temperature or pressure alarms to alert the operator to upset conditions."

4. VC-22

Comment: Gas holders cannot practically hold the vinyl chloride contained in an entire reactor batch if the reactor is large. (See p. 4-30 of SSEIS).

Response: It is technically feasible to construct a gas holder to hold the contents of the entire batch of a large reactor. At least one new plant is set up to discharge one reactor batch to another reactor and thus the second reactor is a "gas holder."

5. VC-22

Comment: The calculation on p. 4-22 of the SSEIS, Vol. I is in error in using tapped bulk density of polyvinyl chloride instead of true density (87 lbs/cu ft).

Response: EPA concurs with the correction. The true density was not available to EPA at the time of the calculation.

6. VC-22

Comment: The statement on page 4-76 "... each of these techniques can reduce the vinyl chloride content of the case being treated to less than 10 ppm," should be qualified by noting that use of the techniques (adsorption, absorption, and incineration) has not been demonstrated under production conditions for all sources.

Response: EPA agrees that these techniques have not been used under production facilities for all sources. However, it is believed that these techniques can be designed to meet the emission limit even though different production conditions exist at different plants.

7. VC-22

Comment: Table 4-3, page 4-81 shows achievable emission levels for certain controls on certain sources to be zero emissions. This figure is inconsistent with reported performance of control devices. (Also same comment for Table 4-4, p. 4-83).

Response: Where the emission factors were less than 0.001 kg/100 kg they were considered zero.

8. VC-33

Comment: Double mechanical seals are fine for vertical vessels but for horizontal vessels, a grease stuffing box is safer and more practicable.

Response: EPA concurs that the two methods are equivalent.

9. VC-34, Attachement 1, page 1

Comment: "Stripper losses", as reported in Tables 3-6 and 3-7 do not exist and should be deleted.

Response: In the spring of 1974, (the baseline for all of EPA's emission data) not all strippers were vented to a recovery unit. EPA averaged the emissions from these plants over the entire industry for the factors given on Tables 3-6 and 3-7.

10. VC-29

Comment: A more reasonable polymerization cycle time for suspension polymerization than the 6 hours given in tne SSEIS is 10-12 hours/batch.

Response: EPA agrees.

11. VC-29

Comment: The saturation point for vinyl chloride monomer in water is 1100 ppm at standard conditions, thus it is impossible to have concentrations of 2000 ppm as reported on page 3-15.

Response: The 2000 ppm figure was given to EPA by the B. F. Goodrich Chemical Company in a visit to their Henry, Illinois, plant on April 8, 1975. The estimate was based on their own tests of inprocess waste water from the plant. EPA feels that the condition is possible under non-equilibrium conditions with impure water streams.

12. VC-29

Comment: The origin of the data in Tables 3.6-3.9 is not reported, nor is the specific process for Table 3.7 identified.

Response: Tables 3.6 through 3.9 were developed from data submitted by vinyl chloride monomer and polyvinyl chloride producers in response to a May 31, 1974, section 114 request by Mr. Don Goodwin. Table 3.7 deals with both dispersion and latex resins.

13. VC-29

Comment: In bulk plants, the popo reactor may be cleaned after each batch and must be opened to transfer the product. This is clearer than the statement given in section 3.2.2.3 of the SSEIS, Vol. I. New data is available on emissions from bulk plants to update Table 3.8 of the document.

Response: EPA agrees with the first comment. While emission factors have changed in bulk plants, EPA does not plan to update Table 3.8. The factors in that table are based on data supplied to EPA in May 1974, the base date for the uncontrolled plant.

14. VC-29

Comment: The estimates in Table 3-9 for solution resins are incorrect since reactor opening loss and dryer loss are both non-existent.

Response: On June 26, 1974, the sole manufacturer of this type of product reported a dryer loss. The company also reported a precipitation tank loss equivalent to the reactor opening loss. The category in Table 3-9, "reactor opening loss" should be considered "precipitation tank loss."

15. VC-29

Comment: According to Chapter 4, carbon adsorption is not applicable to streams with low vinyl chloride monomer concentration, high in water and particulate and composed mainly of air. Untested technology, such as this, should not be considered in the document. The discussion of carbon adsorption and ion exchange resins is irrelevant to the study.

Response: Chapter 4 never said that carbon adsorption was inapplicable to any particular source. The document states that carbon adsorption is more practical for some than for others. There are no sources in ethylene dichloride-vinyl chloride or polyvinyl chloride plants where carbon adsorption is technically impossible to apply. Carbon adsorption is used commercially on similar streams.

16. VC-29

Comment: Spray towers, spray chambers and venturi scrubbers are inefficient devices as solvent adsorbers. Ten ppm would be impossible. Scrubbing vinyl chloride monomer gases to 10 ppm using water or aqueous solutions of sodium carbonate or sodium hydroxide is not possible using present technology. Use of a lower volatility solvent is not feasible because of problems in separating vinyl chloride monomer and the solvent.

Response: EPA did not claim, in Chapter 4, that any of the described solvent absorbers could achieve 10 ppm. The chapter pointed out that a number of factors affect control efficiency on these devices including temperature, concentration, and design.

17. VC-29

Comment: The figures used in pages 4-34 and 4-35 of the _Standard Support and Environmental Impact Statement_ are incorrect. The references should be Table 3-6, not 3-5 and the reactor opening loss is 0.14 kg/100 kg/not 0.46.

Response: The table number is incorrect. The figure for reactor opening loss includes the figure in Table 3-6 for opening of 0.14 and stripper loss of 0.32.

18. VC-29

Comment: The suggestion on page 4-46 that equipment could be fitted with high pressure spray heads is incorrect for the majority of existing reactors which do not have nozzles of adequate size to permit passage of the spray head.

Response: EPA points out again that not all of the discussed control procedures are applicable to all sources.

19. VC-29

Comment: The discussion of polyvinyl chloride inprocess waste water should note that the suspension resin process is involved. All data given is based on the suspension process.

Response: EPA concurs.

20. VC-17

Comment: The preamble and the document suggest that bulk process reactors be purged with nitrogen gas and vacuum. The writer suggests that steam has been shown to be effective in some cases.

Response: EPA concurs.

21. VC-21

Comment: "EPA does not define dispersion, latex, and emulsion resins well. Clarity is needed in the process description. The following is offered: "The dispersion polymerization is discussed as though these are basically emulsion type polymerizations. Although the emulsion process is used, or can be used, to produce some dispersion resins it is not the principle method used. The comments describing the equipment are in error. The process is similar to the suspension process only in that monomer, water and catalyst are used in the polymerization. The difference is not that more soap is added to the slurry to stabilize the monomer droplets and form agglomerates. Suspension resin (p. 3-11) uses vinyl chloride monomer, water, catalyst and suspending agents, not soap. Dispersion resins use a dispersing technique which does not relate to suspending techniques as the article implies. If the emulsion process is used, it uses an emulsifying technique which again is quite different."

"The particle size of the suspension resin after polymerizing and after drying is essentially identical. The particle size of the dispersion or emulsion resin after polymerizing is sub-microscopic. The spray dryer used to dry dispersion resins produces a particle size which depends on the type of spray.

"Latex resins are not produced by the dispersion process; they are produced by the emulsion process, quite different, technically. More soap may be used but not during the polymerization. In some instances soap may not be added after polymerization which results in an unstable condition and leads to difficulty in stripping."

Response: EPA agrees that perhaps more clarity is needed in defining the various resins in the process description. The Agency points out, however, that these distinctions do not affect the proposed standard.

22. VC-21

Comment: On page 3-13, polymerization pressure is stated to be 5.1-5.8 atmospheres while on page 4-30, polymer pressure is stated to be 6.1-7.8 atmospheres. The latter figure is more nearly correct.

Response: EPA agrees.

2.10 Comments on Quantitative Risk Assessment for Community Exposure to Vinyl Chloride

1. VC-22, VC-27, VC-29, VC-32, VC-34

Comment: The risk assessment should have been based on the log-probit model, rather than the linear no-threshold model.

Response: A number of arguments were made by industry in support of this comment; they are discussed in turn.

First, it was argued that the risk assessment document was biased in favor of the linear model. It was the intention of the authors that the two extrapolation methods should have equal status; any impression to the contrary was inadvertant. Both methods are supported in the scientific literature, and both are equally lacking in empirical confirmation. It is true that the log-probit model results were shown as a range determined from a sensitivity analysis of the linear model results. This was done because it is computationally much more difficult to get a single number for the log-probit model, and the value of the number for the decision maker did not appear commensurate with the amount of work required to get it. Because the log-probit curve is non-linear and falls off very rapidly with dose, the results will be determined by the groups with the highest exposure and it is not valid mathematically to apply it to average data for large groups (as several industry comments have done). It would be necessary to perform a separate calculation for each community, direction, and distance category (over 2,500 combinations), and even this might not be sufficiently fine-grained. The only payoff of this massive amount of work would be to know just where in the range of, for example, 0.1 to 1 cases/year the log-probit results fall. Knowing this would not greatly help the Administrator in making a responsible decision.

Second, it was argued that the log-probit model better fitted the actual animal data and should therefore be the basis for extrapolation. While it is true that the deviations of the log-probit model from the actual data were somewhat smaller than for the linear model, the differences are not large enough to have any statistical significance. And even if they were statistically significant, that would not necessarily be a controlling consideration. The choice of a preferred extrapolation method should depend on one's view of the mechanisms of carcinogenesis and on the degree of conservatism one feels is appropriate. Neither of these is greatly affected by small differences in the fit of the two curves at high doses. And even if it is believed that variations in susceptibility are the main factor affecting dose-response, no information is available on the tails of the distribution.

Third, it was argued that the log-probit method is more generally accepted or that "Nature seems to operate in the normal distribution (log-probit) mode." In fact, it seems more accurate to say that both approaches have support in the literature; support for a linear model is found, for example, in Hoel, et al., "Estimation of Risks of Irreversible, Delayed Toxicity," J. Toxicology & Environmental Health, Vol. 1, No. 1 (1975) and FDA Advisory Committee, "Panel on Carcinogenesis Report, Toxicology & Applied Pharmacology, Vol. 20, pp. 419-38 (1971). Support for the linear model and its variants is generally based on the notion that cancer occurs as the result of random events at the cellular level.

Finally, it was argued that animal data on the metabolism of vinyl chloride shows that the log-probit model is more appropriate. While there are some difficulties in interpreting these data (which are discussed elsewhere in these comments), this argument may well turn out to be correct. The current state of knowledge is not sufficient, however, to prove it.

In summary, it still appears justifiable to present the results of both models and to allow the decision maker to decide what weight to give to each.

3. VC-29, VC-34

Comment: Recent animal studies indicating a change in the pathways for vinyl chloride metabolism at low doses suggest that a threshold dose rate exists below which cancer is not expected to occur.

Response: The metabolic studies do not measure tumor incidence, which is the end result of many biochemical reactions and cellular changes which are not well understood. Therefore, they are not directly relevant to the quantitative relationship between cancer incidence and dose rates. It is not known whether the malignancy results from the parent compound, one of its many possible metabolities, or from some consequence of the reactions which metabolize the compound. Since each of these possibilities is expected to have its own dependence on the dose rate, it is not possible to rule out the linear, no-threshold model. The metabolic pathways in man may be different than those in the animals studied.

4. VC-22, VC-27, VC-29, VC-32, VC-34

Comment: The risk assessment should have used the much lower ambient concentrations measured in EPA's monitoring study, rather than use diffusion modeling results.

Response: The data referred to were not available when that part of the risk assessment was done. The decision was made to use the diffusion modeling results, which were the best information available at the time. The best available estimates of vinyl chloride emissions were also used. Diffusion modeling is a generally accepted technique in the air pollution field. The fact that two independent groups produced very similar results added to confidence in the diffusion modeling (although both are based on the same estimates of total emissions).

The risk assessment made clear that the situation with uncontrolled plants was being evaluated. The EPA monitoring in question occurred after the OSHA standard had been promulgated, so that the plants may have been operating more carefully to limit workers' exposures. It also occurred during an economic recession, during which production rates may have been less than full capacity. It seems doubtful, however, that these factors can account for a difference as large was was observed. In any future revision of the risk assessment, the monitoring data will be taken into account. It is possible that if this were done, the risks would be approximately one-tenth of the current estimates.

It should be noted that the risk assessment is not required by the Act and that the standard is not derived from it in any direct sense. It forms part of the background information available to the Administrator in deciding on the seriousness of the problem of vinyl chloride emissions.

2. VC-22, VC-23a, VC-29, VC-34

Comment: What importance should be attached to the negative finding in the risk assessment document of liver angiosarcoma cases clustered around ethylene dichloride-vinyl chloride and polyvinyl chloride plants?

Response: The risk assessment document described a survey of liver angiosarcoma cases in which evidence of higher than average clustering of cases among people living near ethylene dichloride-vinyl chloride and polyvinyl chloride plants was sought but not found. The document concluded that, for several reasons, the survey was not sensitive enough to detect such clustering even if it did occur, unless the actual rate of vinyl chloride induced angiosarcoma is many times greater than the maximum rate predicted by the model.

Industry comments generally interpreted the survey as evidence that cancer is not caused by community exposure to vinyl chloride, and a comment from an environmental group pointed out factors not considered in the document which would make the survey even less sensitive than stated.

One industry comment alleged, but could not support this definite information, that the ambient concentration at some plants could have been more in past years than in 1974. Another industry stated that at one plant emissions did not change appreciably from the early 1950's to 1974, and consequently estimated that the risk to that community has not increased in this period.

In order to make the risk estimate more realistic, the Agency would need reliable information about historical vinyl chloride and polyvinyl chloride production rates at each factory site. Because such localized information is not available, the document draws conslusions only about national averages. The comments received were not extensive enough to invalidate the assumption that the average vinyl chloride concentrations were proportional to the polyvinyl chloride and vinyl chloride production rates. Therefore people in recent years have been exposed to higher vinyl chloride concentrations and the conclusion still remains that surveys conducted now cannot detect a large portion of cancers that may have already been initiated by vinyl chloride exposure.

The environmental group commented that the latent period is probably longer for people exposed to low community vinyl chloride concentrations than for those occupationally exposed (a factor ignored in the risk document), so that any community cases observed in the survey would represent exposures earlier, and therefore, at lower ambient concentrations than stated in the risk document. If the Agency had considered this factor, a stronger case could be made for rejecting the survey conclusions and, therefore, for being unable to rule out the possibility of vinyl chloride induced cancer in the community.

The Agency has decided that, since no new data on these points was submitted by the industry groups or the environmental group, the risk document should still leave open the possibility that vinyl chloride could have induced cancer in people living near plants which is currently undetectable in the population.

5. VC-32, VC-37

Comment: In estimating the incidence of liver angiosarcoma among vinyl chloride and polyvinyl chloride workers, the risk document selected studies showing the highest incidence and ignored those showing lower incidence in order to artificially increase the risk estimates.

Response: The objective of the literature survey of occupational cases was to obtain the incidence of liver angiosarcoma in a homogenous population of workers who were all highly exposed to vinyl chloride in a situation where the concentration could be estimated. Of the four studies found where the incidence of angiosarcoma among highly exposed workers could be calculated, one was a large study of 33 plants, each with its own definition of high exposure. It was rejected because the population was too heterogeneous and because of the resulting difficulty in establishing an exposure level for the group. A second study of two plants with a group of workers almost as large as the first group but with no evaluation of separate job categories reported all types of liver cancer. It was rejected because of the large mix of job categories in the population. The remaining two studies were both restricted to workers directly exposed to high concentrations of vinyl chloride. The incidence rates in these two studies were similar and higher than the two larger studies that were rejected. These rates are consistent with the hypothesis that the larger populations had a heterogeneous mixture of jobs with a range of exposures. Unfortunately we had to go to a third study in order to estimate the concentration of vinyl chloride to which this occupational group was exposed.

Therefore, the selection of studies was necessary in order to arrive at an incidence rate which was valid for a population exposed to a known vinyl chloride concentration.

6. VC-23a, pp. 9-10 of EDF testimony

Comment: The risk assessment may understate the risk because it does not reflect the effects of pre-natal and childhood exposure, possible synergistic effects, or the effects of adult exposure for entire lifetimes.

Response: Ideally, animal studies for environmental carcinogens should involve exposure from conception to death. Unfortunately, the animal data on vinyl chloride were designed to simulate occupational rather than environmental exposure. For the risk assessment, it was necessary to do what was possible with the available data.

There is no data that would make possible an estimate of different susceptibility of fetuses or young children to the carcinogenic activity of vinyl chloride, or of possible synergistic (or antagonistic) effects of other environmental agents. Hence, such factors were not included in the calculations; the comment is correct that this is an additional source of uncertainty in the estimates. It is not possible to be sure that they would lead to higher estimates of effects.

The problem of limited adult exposure duration, one year for rats, up to 30 years or so for humans, was handled in a conservative way in the risk assessment. It was assumed that each period of exposure would have the same probability of causing cancer after correcting for species lifetime effects as that observed in the animal experiments, where young rats were exposed for about half their lifetime. This leads to an overstatement of the actual risk because of the long latency period, since pre-cancerous changes occurring late in life are less likely to cause clinical disease before death intervenes from other causes.

2.11 Miscellaneous

1. Comment: Several commentators pointed out typographical, editorial, and conversion factor errors in the proposed standard. The errors have been corrected in the promulgated standard and are listed below along with the commentators that pointed them out.

1. The conversion factor for liters to gallons is 3.8 l/gal, not 4.1 or 4.4 l/gal. VC-14, VC-21, VC-26, VC-27, VC-29, VC-32.

2. The word "chloride" was left out of §61.64 (e)(1)(i). VC-13, VC-29.

3. In §61.65 (b)(3)(iii) and (iv) in the phrase "so that any leak that occurs is into the pump," the word "pump" should be replaced with "compressor" and "agitated vessel," respectively. VC-25, VC-35.

4. §61.70(a)(4) should refer to §61.65(a) instead of §61.65(b). VC-21, VC-31.

5. §61.65(c) should refer to equipment $\geq$ 5500 l (1250 gal). VC-31.

6. There should be a paragraph following §61.67 explaining that Test Methods 106 and 107 are being added to Appendix B of Part 61. VC-35.

7. §61.65(b)(9)(i) should be corrected to say "inprocess wastewater stream is to be reduced to 10 ppm" instead of "by 10 ppm." (emphasis added) VC-35.

There were also some errors pointed out in supporting documents.

1. In the STAR document, the nameplate capacity of Shell Chemical Company's plant in Deer Park, Texas should be 380 x 10^6 kg/yr instead of 410 x 10^6 kg/yr. VC-27.

2. In Table I of the "Quantitative Risk Assessment for Community Exposure to Vinyl Chloride," entries 65 and 66 are incorrect. With regard to entry 65, Tenneco does not have a vinyl chloride or polyvinyl chloride plant in Painesville, Ohio, and therefore this entry should be eliminated from the Table. With regard to entry 66, Tenneco does have a facility at Pasadena Texas, but that facility manufactures only polyvinyl chloride; it does not manufacture vinyl chloride. VC-15.

2. VC-18, VC-29, VC-30

Comment: Under the provisions of section 112 of the Clean Air Act, EPA may grant a waiver of compliance with a standard for a period not exceeding two years from the effective date of the standard. Plant owners and operators will need to take advantage of this provision.

Response: No response necessary.

3. VC-13, VC-25

Comment: The definition of "in vinyl chloride service" in §61.61(1) of the proposed standard should be revised in the following three ways.

(1) Add the qualification that the equipment must be operating under pressure. A piece of equipment that is not operating above atmospheric pressure cannot emit vinyl chloride to the atmosphere.

(2) The words contain vinyl chloride should be changed to contacts vinyl chloride. As an example an agitator does not contain material, but contacts the material being agitated.

(3) The qualification should be added that the principle phase of the contents of the equipment contains 10 percent vinyl chloride. The basis for this suggestion is to alleviate problems with vessels that contain stripped-to-specification slurries (the principle phase) but whose vapor space at the low pressure still might contain 10 percent by volume of vinyl chloride.

Response: The definition of "in vinyl chloride service" has been revised to incorporate the second suggestion, but not the first or third. EPA intends to cover the situation described in the third suggestion. The benefit of adding the first suggestion is not apparent.

4. VC-28

Comment: Clarification on the following two questions is requested:

(a) Once the residual vinyl chloride levels of 400 ppm for suspension resins and 2000 ppm for dispersion resins are met, may fugitive emission sources from equipment downstream from the reactor (reactor/stripper), exceed 10 ppm?

Response: If the 400 ppm and 2000 ppm limits have been met in the stripper, the fugitive emission limits do not apply to equipment downstream of the stripper.

(b) Once a vessel is evacuated to the required level for opening, may the remaining vinyl chloride be collected to a system whose stack exit concentration exceeds 10 ppm.

Response: Yes. The vinyl chloride removed from the equipment in order to meet the requirement for opening must be treated to meet the 10 ppm limit. The vinyl chloride remaining in the equipment after the requirement for opening is met is allowed to go to the atmosphere. It is assumed that the commentator is referring to a purging hose which is typically used by the industry to remove any remaining vinyl chloride from the reactor. Emissions from other sources may not be mixed with the reactor opening loss and exceed the 10 ppm limit.

5. VC-14, VC-26, VC-32, VC-34, VC-39

Comment: The equipment specifications for fugitive emission sources are not authorized under section 112 of the Clean Air Act. VC-34 states that the only fugitive emission regulation that is worthwhile is the one requiring leak detection. Just requiring a leak detection program would allow plants more latitude than the proposed regulation in controlling fugitive emissions.

Response: In the preamble to the proposed standard, EPA explained in detail why it had decided to regulate some fugitive emission sources with equipment specifications. Numerical emission limits were used for each emission point where possible; however, equipment and operating procedures are specified for some of the fugitive emission sources from which emissions cannot be measured or calculated or for which it would be grossly impractical to do so. Generally, the reason that these emissions cannot be measured is that they are released into an unconfined area and often from many small sources, and there is no practical testing procedure for obtaining a reliable reading of emission levels. Where equipment or operating procedures are specified, plant owners or operators are generally allowed to use other equipment or procedures, demonstrated to be of equivalent effectiveness. Primarily because fugitive emissions compose such a large proportion of the total emissions at ethylene dichloride-vinyl chloride plants, EPA has determined that control of such emissions by specification of equipment and operating procedures is preferable to the alternative of leaving such emissions unregulated.

6. VC-46

Comment: The environmental impact statement was prepared after standards were proposed and published in the FEDERAL REGISTER.

Response: Drafts of the environmental impact statement were available to interested parties as early as March 1975. The information in these drafts was the basis of the proposed standard.

7. VC-46

Comment: Reference is made to one company in Chapter 2. Naming one plant out of several is inappropriate. The term "Vulcan Materials" should be substituted by an appropriate synonym so as to read "with the exception of one plant."

Response: The suggestion is probably appropriate. However,the document is not being rewritten, so this change will not be made.

8. VC-46

Comment: It should be stated that the total emissions from the vinyl chloride plant are one-third of the emissions from the polyvinyl chloride fabricating plants.

Response: Table 2-1 on page 2-28 of the Standard Support Document lists the 1974 vinyl chloride emissions from ethylene dichloride-vinyl chloride plants as being 11 million kg per year and from polyvinyl chloride fabricating plants as being 600,000 kg per year.

9. VC-46

Comment: In Chapter 2, it is stated that "all vinyl chloride emissions from the fabricating plants are due to residual vinyl chloride in the raw materials coming from polyvinyl chloride plants." This statement is incorrect. Emissions in fabricating plants result from the vinyl chloride contained in the raw polyvinyl chloride used in the fabrication.

Response: The difference between the two statements is unclear.

10. VC-45

Comment: The data from the ambient sampling program around Shell's ethylene dichloride-vinyl chloride plant is not included under the data for Region VI on page 27 of the STAR document.

Response: This data is on page 30.

11. VC-45

Comment: The ambient sample data reported from grab samples in Tedlar bags is totally unreliable. If the grab sample data is going to be referred to or tabulated in the report, there should be some reference made to the use of a bag containing plasticizers.

Response: The fact that Tedlar bags contain plasticizers should not be a problem. EPA conducted a study under contract on Tedlar bags and aluminized Milar bags. Samples containing specified quantities of vinyl chloride were placed in both the Tedlar and aluminized Milar bags for a period of one month. The Tedlar bag showed no loss or increase of vinyl chloride. It also did not show peaks due to decomposition products from the bag. The Milar bag did, however. Zero concentrations of vinyl chloride were also placed in the Tedlar bags and no response was observed.

The vinyl chloride content of the Tedlar bags used during the sampling program was measured with gas chromotography and in some cases cross-checked with mass spectrometry. Based on the study discussed above, it is unlikely that the plasticizers in the bags caused interference with the vinyl chloride peak on the gas chromatograph.

12. VC-39

Comment: It is unfortunate that EPA could not and did not visit all plants. As a result, the commentator's plant was not given sufficient recognition within the regulation as utilizing the best available technology.

Response: Time did not permit EPA to visit all plants. The SSEIS, Vol. I does not characterize individual plants, but only the average plant. Since the comment letter was received, EPA has visited this particular plant. The plant does have many of the control systems required by the standard, particularly for the fugitive emission sources and relief discharges.

13. VC-39

Comment: The regulations should state the emission reduction possible for the entire class or category of point sources within a given range and should analyze those factors deemed important for the writing of each individual compliance schedule within that range. More consideration needs to be given to formulating a more detailed approach for the issuance of each compliance schedule.

Response: The specifics for the compliance schedules are in §§61.10 and 61.11 of the general provisions.

14. VC-18, VC-24, VC-33, VC-34

The standard should provide for variances for infrequent operations that produce small emissions. An example would be the requirement to strip vinyl chloride from water which has been used to purge vinyl chloride from a storage sphere before opening it.

The standard should provide for excess emissions during start-up, shut-down, and malfunction. EPA has not included in its economic impact statement the costs which would be incurred during a malfunction either to shutdown production or to install back-up control equipment.

EPA should at least provide for excess emissions during a shutdown. If a breakdown occurs in the emission control equipment, there are on-going reactions in a plant that must be brought to completion prior to shutdown. This will require venting in excess of 10 ppm until a safe shutdown can be accomplished or the malfunction in the control system corrected.

One option would be to have a steam factor of 0.9 with a maximum emission limit of 0.04 kg/100 kg of product produced during noncompliance. This option would allow operators to repair, maintain, and modify operation of control devices that malfunctioned or required preventive maintenance without terminating production or otherwise seriously disrupting operations. In our plants (VC-18) this would cause a maximum increase in annual emissions of about 10 percent at the polyvinyl chloride plant and about 20 percent at the ethylene dichloride-vinyl chloride plant.

Response: (1) Variances.

There are no provisions at the present time for variances for standards promulgated under sections 111 or 112. The water used to purge vinyl chloride from a storage sphere would have to be treated only if it contains more than 10 ppm vinyl chloride. If it does need to be treated, it would not appear to be practical to install a larger water stripper for this purpose. Storing the water in that vessel or some other holding tank until it could be treated seems to be a more plausible solution.

(2) Startup and shutdown

Startup and shutdown provisions are not relevant for polyvinyl chloride plants because startup or shutdown of the process has essentially no effect on emissions to the atmosphere. For ethylene dichloride-vinyl chloride plants, only one comment mentioned a source of emissions during startup which would present control problems. During startup the hydrogen chloride stream that is normally vented to the oxychlorination process from the cracking furnace is vented to the atmosphere. The commentator vents the hydrogen chloride stream to the atmosphere since the oxychlorination process is not operating. The gas stream contains emissions in excess of the 10 ppm standard. EPA discussed this problem with two other companies. Both companies avoid venting the hydrogen chloride gas stream to the atmosphere by starting up the oxychlorination process before the cracking furnaces. There is no apparent reason why this procedure could not be adopted by the other companies.

(3) Malfunction

Section 112 of the Clean Air Act has been reserved for the regulation of pollutants, such as vinyl chloride, which may cause, or contribute to, an increase in mortality or an increase in serious illness. Because of the serious nature of the health effects of pollutants regulated under section 112, EPA has determined that it would not be appropriate to consider adding malfunction provisions to the regulation unless the Agency was convinced that the additional emissions occurring during the malfunction did not increase the risk of health effects. There is no conclusive evidence to this effect for vinyl chloride. Therefore, when a malfunction occurs, compliance with the vinyl chloride regulation consists of promptly shutting down.

It could be argued that EPA, in providing for emergency relief discharges, in effect provided for excess emissions during some types of malfunctions. Emergency relief discharges, however, are in a different category. Safety considerations require the use of relief valves on equipment in which vinyl chloride is processed or stored under pressure. There are several preventive measures which can be undertaken to reduce the pressure in the equipment to prevent a relief discharge. In cases where these preventive measures have been undertaken, and the pressure continues to build-up in the equipment, the standard allows relief discharges. Relief valves discharge only the amount of vinyl chloride necessary to reduce the excess pressure in the equipment. The alternative would be rupture of the equipment and release of its total contents, and perhaps fire.

15. VC-35

Comment: Clarify what emissions are to be measured on a continuous basis.

Response: A monitoring device is required to measure vinyl chloride concentrations at certain points within the plant on a continuous basis. Typically this involves a central analyzer with twenty or more sampling points. The purpose of this requirement is leak detection. EPA's standard requires that sampling points also be located in the stacks to measure outlet concentrations on a continuing basis.

Reactor opening emissions and stripped resin samples are also required to be measured on a continuing basis, but this is not related to the vinyl chloride monitoring device. Testing methods are specified for each of the sources.

16. VC-35

Comment: Regarding the absence of a proposed standard for polyvinyl chloride particulate and EPA's determination that direct regulation of the particulate is unnecessary, the following is provided:

"A recent complaint received was about a polyvinyl chloride fabricating plant indicating that accidental intermittent release of polyvinyl chloride particulate emissions, because of process malfunction, were impacting the surrounding ambient air to which the public has access. Serious concern therefore is expressed for the respiration or inhalation of the polyvinyl chloride particulate and any carcinogenic health effects that may result from residual vinyl chloride in the particulates, especially where such emissions are common occurrences and complacency is found in efforts to correct such accidental emissions.

Clarification of carcinogenic health effects of polyvinyl chloride particulate, with appropriate regulation, is recommended as soon as health effects data from NIOSH are evaluated.

Response: In the preamble to the proposed standard, EPA stated that additional information may indicate a need to regulate polyvinyl chloride particulate. The information submitted by the commentator is appreciated.

17. VC-32

Comment: The preamble to the proposed standard states (40 FR 59543) that studies show that polyvinyl chloride particulate "may possibly" cause pneumoconiosis. Stiles and Wilson [Ann. Occup. Hyg. 16: 241 (1973] clearly demonstrated no such effect from polyvinyl chloride dust.

Response: The studies EPA referred to include:

1. B. B. Szende, et. al.; "Pneumoconiosis Caused by the Inhalation of Polyvinyl Chloride Dust," Med. Lavoro, Vol. 61, no. 8-9, 1970, p. 433.

2. Yu. J. Verthin and Yu. R. Mamontov, "On the State of the Bronchopulmonary System in Workers Engaged in the Manufacture of Articles Made of Polyvinyl Chloride," Gigiyena Tudor) Vol. 14, No. 10, 1970, pp. 29-32.

EPA will await additional studies being conducted by NIOSH to determine the need to regulate polyvinyl chloride particulate.

18. VC-32

Comment: It is not clear from the discussion in section 4.9 of the SSEIS, Vol. I which decision was reached on reactor opening emissions since no statement is made as to the final conclusion, but from section 4.12.5 and Table 7.8 it is assumed that the gasholder was chosen. Substantially the same effect can be obtained by the use of vacuum pumps, which can reduce the internal pressure well below 100 mm Hg absolute, to give a reduction of vinyl chloride vapor in the reactor of at least 87 percent. An expenditure of over $1.5 million per plant is an excessive price to pay for the additional 12 percent reduction of an estimated loss of 3.6 percent of the total. This requirement should be omitted.

Response: The type of control used to meet the reactor opening standard is left up to the plants. Water purge and vacuum are both control methods that can be used to meet the standard. Plants will be expected, however, to have gasholders or some other empty vessel for prevention of reactor relief discharges.

19. Proceedings of Public Hearing, Presentation by Barry Castleman, p. 30.

Comment: I would be interested in knowing from EPA what the update situation on vinyl chloride and livestock is.

Response: EPA and the Department of Agriculture are co-sponsoring a study to determine whether vinyl chloride appears in food supplies due to livestock living near polyvinyl chloride plants.

20. VC-49

Comment: Are all treatment ponds carefully lined and sealed to prevent leakage to ground water? If not, the significance of reported zero concentrations of effluents from the ponds may need to be reexamined.

Response: According to one company, they have two types of ponds. For one type the bottom is one foot thickness of compacted impermeable clay. These ponds are located in the same area with wells. No vinyl chloride has been detected in the water from the wells. For the second and newer type, the bottom is composed of an impermeable polypropylene liner.

21. VC-49

Comment: In general under the proposed standard, the low density of the vinyl chloride is counted upon to permit escape of the substance from water into air. That is, removal is to be accomplished by stripping and evaporation. The length of time that a free water surface is available may require consideration as the temperature, the flow conditions, such as turbulence, before infiltration to groundwater or confinement of surface flow can occur, should be assessed. Flow conditions of water discharge from a plant may prevent escape to the air, either by confinement or local pressure conditions. Quick infiltration or restraint of surface flow of the water bearing vinyl chloride might prevent escape of the chemical as a result of such factors as pressure condition, aquifer texture, and sorption properties with respect to sediments, carbon, etc.

Although removal is estimated to be essentially complete, monitoring in specific situations is needed to verify this conclusion.

Response: As stated by the commentator, there are multiple factors which influence the rate at which vinyl chloride is transferred out of water into the air. These factors should be taken into account when designing the water stripper used to meet EPA's standard. EPA has conducted studies on the behavior of vinyl chloride in water. A report on this study entitled Dynamic Behavior of Vinyl Chloride in Aquatic Systems has been prepared (January 1976) and is available from the Environmental Research Laboratory, Office of Research and Development, EPA, Athens, Georgia, 30601. The conclusions of this study are discussed on page 6-45 of the SSEIS, Vol. I.